



**FACULTÉ  
DES SCIENCES**



UNIVERSITÉ LIBRE DE BRUXELLES

# **On what to assess when bridging sustainability pillars in S-LCA**

**Exploring the role of chain governance and value distribution in  
product social sustainability**

**Thesis submitted by Solène SUREAU**

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## Abstract

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Today's supply chains entail numerous and serious issues, concerning the environment but also regarding people, including communities' surrounding production activities, final consumers and workers. In order to assess those latter social and socio-economic impacts on people, Social life cycle assessment (S-LCA) is a tool being currently developed to complement E-LCA, which assesses potential environmental impacts along the life cycle of products and services. This PhD aims to address some of the outstanding methodological challenges faced by S-LCA, with the support of an application on products from Belgian alternative food network (AFNs). The thesis focuses on three related main questions: *i)* what should S-LCA assess (topics, level of assessment, i.e. company's practices, impacts on people, other) and *ii)* how to include impact pathways or cause-effect chains in the analysis, as it is done in E-LCA; *iii)* how should the assessment be carried out, so that it goes beyond a mere reporting? On the basis of three distinct states-of-the-art (on S-LCA frameworks, studies considering impact pathways and S-LCA studies in the food sector), we put forward and apply specific methodological proposals that argue for *i)* the use of a participatory approach to select assessment criteria; *ii)* the use of an impact assessment approach that allows to understand company's practices rather than their mere reporting, through an articulation of assessment criteria and indicators based on existing theories, including in social sciences. In this regard, the Global commodity chain approach that identify chain governance and value distribution among chain actors as potential stressors or root causes of social and socio-economic problems in supply chains, seems particularly relevant; *iii)* the use of a nested approach to sustainability in which also economic and governance aspects are taken into account, in addition to managerial and "social" aspects of supply chains, which are usually included. With this work we aim to contribute for S-LCA to become an analytical tool contributing the improvement of main problems in supply chains, e.g. income, employment and working conditions, by analyzing their root causes. Our assessments of products traded under various alternative chains, including short food chains and a local Fair trade chain, reveal low income and poor employment conditions on farms. This rejects our assumption of better social sustainability performances of AFN products, when compared to those of mainstream chains. Those poor performances would originate in the mechanisms used (e.g. unbalanced power relations, low commitment between VCAs, unfair prices), which are similar in mainstream chains. This would tend to confirm our assumption that chain governance and transaction modalities (i.e. business practices of chain actors) impact on socioeconomic conditions of workers in supply chains (or for the social sustainability of products), this is why we think it is of interest to consider those aspects in S-LCA. Also, other, more contextual, elements seem to come into play, such as labor regulations in force, that would encourage the use of non-standard forms of employment, and broader market context that influences AFNs quite strongly, including on prices. This is why it seems also important to work on mainstream food chains to improve overall product sustainability. Our research confirms the applicability and relevance of our methodological proposals, however further applications could be useful for further validation and methodological developments.

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## Résumé

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Les chaînes d'approvisionnement contemporaines sont source de problèmes environnementaux, mais aussi d'impacts pour les communautés des abords des activités de production, consommateurs, ou encore travailleurs. Pour évaluer ces impacts, l'analyse sociale du cycle de vie (ACV-S) est développée depuis quinze ans en complément de l'ACV-E, qui traite, elle, des impacts environnementaux le long du cycle de vie des produits. Cette thèse vise à répondre à certains des défis méthodologiques pour sa conception et son application, par une évaluation de produits de systèmes alimentaires alternatifs belges (SAA), et à ces deux questions: i) que devrait évaluer l'ACV-S et ii) comment intégrer les chaînes de causes à effet dans l'analyse, comme en ACV-E. Sur base de trois états de l'art (des cadres d'ACV-S, des études incluant les chaînes de cause à effet, et des évaluations de produits alimentaires), nous développons et mettons en œuvre des propositions qui plaident pour i) une approche participative pour définir les critères; ii) une évaluation d'impact pour comprendre les pratiques des entreprises plutôt que leur simple rapportage, à travers l'articulation des indicateurs sur la base de théories existantes, comme l'approche de *Global Commodity Chain*: celle-ci place la gouvernance des chaînes et la répartition de la valeur ajoutée entre les acteurs comme des facteurs explicatifs potentiels des problèmes socio-économiques présents dans les chaînes; iii) une approche 'imbriquée' de la durabilité (ou '*nested*'), qui implique la considération des aspects économiques et de gouvernance des chaînes, à côté des aspects managériaux et 'sociaux', et leur mise en relation. Nous cherchons ainsi à contribuer à faire de l'ACV-S un outil analytique qui vise l'amélioration des principaux problèmes dans les chaînes d'approvisionnement, en analysant leurs causes profondes. Nos évaluations de produits de SAA, y. c. circuits courts et commerce équitable 'Nord-Nord', révèlent des rémunérations trop faibles et des conditions d'emploi précaires dans les fermes, rejetant ainsi notre hypothèse d'une durabilité plus élevée de ces produits, par rapport aux chaînes dominantes. Ces faibles performances résulteraient d'une reproduction des mécanismes utilisés par les chaînes dominantes (rapports de force déséquilibrés, faible engagement entre les acteurs, prix inéquitables). Ceci tendrait à confirmer notre autre hypothèse selon laquelle la gouvernance des chaînes et les modalités de transaction impactent les conditions socioéconomiques des travailleurs au sein de ces chaînes, d'où l'intérêt de considérer ces aspects en ACV-S. Aussi, d'autres éléments semblent jouer: la réglementation du travail en vigueur, qui encouragerait les contrats précaires, ou le contexte de marché qui influencerait fortement les prix pratiqués dans les SAA, d'où l'importance de se pencher sur les chaînes dominantes pour améliorer la durabilité des produits alimentaires dans leur ensemble. Notre recherche confirme l'applicabilité et la pertinence de nos propositions, qui mériteraient d'autres applications pour une validation et des développements méthodologiques supplémentaires.

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## List of peer-reviewed publications included in this thesis

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- Sureau, Solène, Sabrina Neugebauer, and Wouter M. J. Achten. 2020. "Different Paths in Social Life Cycle Impact Assessment (S-LCIA)—a Classification of Type II Impact Pathway Approaches." *The International Journal of Life Cycle Assessment* 25 (2): 382–93. <https://doi.org/10.1007/s11367-019-01693-9>.
- Sureau, Solène, and Wouter M. J. Achten. 2018. "Including Governance and Economic Aspects to Assess and Explain Social Impacts: A Methodological Proposal for S-LCA." In *Social LCA, People and Places for Partnership - 6th Social LCA Conference*. Fruitrop Thema. Pescara, Italy. <https://www.fruitrop.com/en/media/Publications/Fruitrop-Thema/Social-LCA-volume-4-6th-SocSem>.
- Sureau, Solène, François Lohest, Joris Van Mol, Tom Bauler, and Wouter M. J. Achten. 2019b. "Participation in S-LCA: A Methodological Proposal Applied to Belgian Alternative Food Chains (Part 1)." *Resources* 8 (4): 160. <https://doi.org/10.3390/resources8040160>.
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## Table of content

FUNDING .....	2
ABSTRACT .....	3
RÉSUMÉ.....	4
ACKNOWLEDGMENTS/REMERCIEMENTS.....	5
LIST OF PEER-REVIEWED PUBLICATIONS INCLUDED IN THIS THESIS.....	7
TABLE OF CONTENT .....	8
ACRONYMS .....	10
LIST OF FIGURES.....	11
LIST OF TABLES .....	12
<b>INTRODUCTORY CHAPTER: CONTEXT, RATIONALE, AND SCOPE OF THE PHD .....</b>	<b>13</b>
1. <i>Why is it relevant to develop S-LCA? Its down-to-earth/empirical roots.....</i>	14
2. <i>What is the rationale of research studies on S-LCA? Its conceptual roots.....</i>	25
3. <i>Why a PhD on S-LCA? The rationale and scope for this research .....</i>	33
<b>1<sup>ST</sup> PART: STATE OF THE ART .....</b>	<b>41</b>
CHAPTER 1: WHAT IS ASSESSED IN S-LCA? A REVIEW OF FRAMEWORKS PROPOSED TO ASSESS SOCIAL ASPECTS OR IMPACTS OF PRODUCT LIFE CYCLES .....	43
1. <i>Introduction .....</i>	43
2. <i>Materials and methods .....</i>	44
3. <i>Results and discussion .....</i>	47
4. <i>Conclusion and perspectives.....</i>	59
<i>Supplementary material 1: Detailed topical and stakeholder coverage of selected frameworks .....</i>	62
CHAPTER 2: HOW SOCIAL IMPACTS ARE ASSESSED IN S-LCA? A REVIEW OF TYPE II OR IMPACT PATHWAY APPROACHES.....	67
1. <i>Introduction and background .....</i>	67
2. <i>Materials and method .....</i>	69
3. <i>Results .....</i>	70
4. <i>Discussion .....</i>	74
<i>Supplementary material 2: Description and characterization of Type II approaches.....</i>	79
CHAPTER 3: WHAT DO S-LCA PRODUCE AS RESULTS AND HOW CAN THOSE BE USED? A REVIEW OF S-LCA STUDIES IN THE FOOD SECTOR.....	87
1. <i>Introduction .....</i>	87
2. <i>Materials and method .....</i>	92
3. <i>Results .....</i>	94
4. <i>Discussion and conclusion .....</i>	100
<i>Supplementary material 3: S-LCA case studies in the agricultural and food sectors.....</i>	102
<b>2<sup>ND</sup> PART: METHODOLOGICAL PROPOSALS AND A SPECIFIC FRAMEWORK FOR S-LCA.....</b>	<b>105</b>
CHAPTER 4: METHODOLOGICAL PROPOSALS FOR SLCA .....	107
1. <i>From state of the art to general principles to configure and conduct S-LCA.....</i>	107
2. <i>Conceptual approach and methodological proposals for S-LCA.....</i>	111
3. <i>Limits identified at this stage .....</i>	113
CHAPTER 5: A SPECIFIC FRAMEWORK FOR S-LCA: FROM A PARTICIPATORY APPROACH TO THE INVESTIGATION OF RELATIONSHIPS BETWEEN CHAIN GOVERNANCE AND OTHER SOCIAL SUSTAINABILITY ASPECTS.....	115
1. <i>Introduction .....</i>	115
2. <i>The use of participatory approaches in configuring S-LCA C&amp;Is: added-value, and limits .....</i>	117
3. <i>Materials and methods: configuring C&amp;Is with a participatory approach .....</i>	118
4. <i>Results: The obtained list of C&amp;Is for S-LCA.....</i>	125



5. Discussion .....	129
6. Conclusions .....	136
Supplementary material 4 .....	137
Supplementary material 5 .....	139
<b>3<sup>RD</sup> PART: APPLICATIONS .....</b>	<b>141</b>
INTRODUCTION TO THE 3 <sup>RD</sup> PART .....	141
1. Overview .....	141
2. <i>Belgian AFNs as a field of application</i> .....	142
3. <i>Objectives of the applications</i> .....	145
CHAPTER 6: HOW DO CHAIN GOVERNANCE AND FAIR TRADE MATTER? A COMPARISON OF SOCIAL SUSTAINABILITY PERFORMANCES OF FOOD PRODUCTS TRADED UNDER 3 BELGIAN AFNS .....	147
1. Introduction .....	147
2. Materials and method .....	149
3. Results of type I LCIA: reporting on hotspots .....	154
4. Results of type II LCIA: interpreting results by linking sustainability dimensions .....	161
5. Discussion and conclusions .....	165
Supplementary material 6 .....	167
Supplementary material 7: Results tables .....	169
CHAPTER 7: HOW DOES PRICE FAIRNESS MATTER? AN ASSESSMENT OF MILK TRADED UNDER THE BIOMILK NORTH/NORTH FAIR TRADE INITIATIVE .....	175
1. Introduction .....	175
2. Materials and method .....	183
3. Results .....	187
4. Discussion and conclusions .....	193
Supplementary material 8 .....	199
Supplementary material 9: How do our results compare with other studies? .....	201
CONCLUSION TO THE 3 <sup>RD</sup> PART: DISCUSSING OUR APPLICATIONS AND PUTTING OUR FRAMEWORK IN PERSPECTIVE WITH OTHER S-LCA FRAMEWORKS .....	203
1. Materials and method .....	203
2. Putting our results in perspective with two other studies .....	207
3. Main conclusion over the strengths and weaknesses of our framework .....	214
<b>CONCLUSION .....</b>	<b>217</b>
1. Synthesis of our research work and of our results .....	217
2. Main conclusions in the context of past and current S-LCA and broader discussions .....	220
3. A look back at our research work: genesis, limits and regrets .....	226
4. Outlook for future research .....	230
<b>REFERENCES .....</b>	<b>231</b>

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## Acronyms

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AFNs:	Alternative Food Networks
AoPs:	Area of Protections
C&I:	Criteria and Indicators
CSA:	Community-supported Agriculture
CSR:	Corporate Social Responsibility
CSS:	country-specific sectors
DALY:	Disability Adjusted Life Years
EC:	European Commision
FTE:	Full time equivalent
ILO:	International Labour Organization
E-LCA:	Environmental Life Cycle Assessment
EU:	European Union
FDI:	Foreign Direct Investment
GCC:	Global Commodity Chain
GDP:	Gross Domestic Product
GRI:	Global Reporting Initiative
GSC:	Global supply chain
HRDD:	Human Rights Due Diligence
ISO:	International Standard Organization
LCC:	Life Cycle Costing
LCI:	Life Cycle Inventory
LCIA:	Life Cycle Impact Assessment
LCSA:	Life Cycle Sustainability Assessment
MNC:	Multinational Corporations
MCM:	Multiple Capital Model
NGOs:	Non-governmental Organizations
NSE:	Non-standard forms of employment
OECD:	Organisation for Economic Co-operation and Development
PPP:	Purchasing Power Parity
PSILCA:	Product Social Impact Life Cycle Assessment database
PSM:	Product Social Metrics
S-LCA:	Social Life Cycle Assessment
SEM:	Structural Equation Modelling
SETAC:	Society of Environmental Toxicology and Chemistry
S&SE:	Social and Socioeconomic
SHDB:	Social Hotspot Database
SPC:	Sustainable Production and Consumption
UN:	United Nations
UNEP:	United Nation Environment Programme

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## List of figures

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Figure 1: Stages of product life cycle (Australian Government in (Life Cycle Initiative 2005)).....	14
Figure 2: The impact assessment method RECIPE2016 (PRé Sustainability 2017).....	15
Figure 3: LCA steps (author).....	15
Figure 4: Non-standard forms of employment (ILO 2016).....	19
Figure 5: Labour income distribution by decile (ILO 2019e) .....	21
Figure 6: Assessment system from categories to unit of measurement in the UNEP/SETAC Guidelines for S-LCA (Benoît and Mazijn 2009, 49).....	28
Figure 7: Scope of CSR and impact assessment techniques of Enterprises and their product (Benoît and Mazijn 2009, 41) .....	33
Figure 8: Stakeholder and sub- categories in the UNEP/SETAC Guidelines (Benoît and Mazijn 2009) ..	35
Figure 9: Structure of the PhD manuscript .....	39
Figure 10: Positioning of indicators on the impact pathways (Russo Garrido et al. 2016).....	46
Figure 11: Positioning of Type I and II inventory data and characterization/referencing results on the impact pathway in the framework of S-LCA (adapted from Russo Garrido et al. (2016)).....	68
Figure 12 : Illustration of the 3 main paths and nine general approaches identified in Type II studies.	70
Figure 13: Decision tree for S-LCA type II research.....	77
Figure 14: Concentration in the agri-food supply chain (Mooney 2017) .....	90
Figure 15: Our proposal in comparison with type I SLCA .....	108
Figure 16: Our proposal in comparison with existing type II approaches .....	108
Figure 17: Conceptual approach underlying our methodological proposals for S-LCA.....	111
Figure 18: Our generic methodological proposals for SLCA.....	112
Figure 19: The five global value chain governance types (Gereffi et al. 2005).....	124
Figure 20. Methodological steps and choices. ....	149
Figure 21. Mainstream product system for fresh vegetables. ....	151
Figure 22. Mainstream product system for drinking milk. ....	151
Figure 23. Product systems of the 4 alternatives for fresh vegetables. ....	153
Figure 24. Product systems of the four alternatives for drinking milk .....	153
Figure 25. Trade-off between commitment and fair price in transaction with farms.....	162
Figure 26: Composition of the yearly average retail price (middle and big retailers) of average half skimmed UHT drinking milk in raw material and gross profit indicators of processors and retailers ..	177
Figure 27: Considered chain in the assessment.....	184
Figure 28: Product system and system boundary.....	184
Figure 29: Basic calculation for the fair price of one liter of milk .....	185
Figure 30: Economic indicators of French dairy farms, 2013 (Dedieu et al. 2017) .....	195
Figure 31: Product system and boundary of the applications of the Guidelines and the MCM Capacities S-LCA.....	204

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## List of tables

---

Table 1: Vulnerable employment and working poverty trends and projections, 2007-2019 (ILO 2018)	17
Table 2: The two main objectives, potential uses and kinds of results of S-LCA studies (Author)	23
Table 3: Selected frameworks for review	47
Table 4: Origin, selection and applicability of assessment C&I in reviewed S-LCA frameworks	49
Table 5: Purpose and assessed phenomena	55
Table 6: Topical and stakeholders coverage	58
Table 7 : List of reviewed studies (listed in the order of publication date)	69
Table 8: Classification proposed in this study compared to other existing classifications	74
Table 9: The two main objectives, uses, results and level of analysis of S-LCA studies (author)	94
Table 10. The list of criteria and indicators (C&Is) for S-LCA	127
Table 11: Comparison assessment criteria/subcategories in food and agricultural S-LCA studies	131
Table 12. Intermediary list of sustainability principles and corresponding criteria	139
Table 13: Correspondence number-article for Table 11	140
Table 14. Chain and value chain actors (VCA) governance of fresh vegetables chains	155
Table 15. Chain and VCA governance of drinking milk chains	156
Table 16: List of criteria, indicators and reference points	167
Table 17: Results regarding transaction modalities for fresh vegetable chains	170
Table 18: Results on transaction modalities for drinking milk chains	170
Table 19: Results on social relations between VCAs for fresh vegetables chains	171
Table 20: Results on social relations between VCAs for drinking milk chains	171
Table 21: Profitability and employment conditions for fresh vegetables chains	172
Table 22: Profitability and employment conditions for drinking milk chains	172
Table 23: Work conditions and satisfaction in farms for vegetables chains	173
Table 24: Work conditions and satisfaction in farms for drinking milk chains	173
Table 25: Results on product's quality, affordability, accessibility and consumer education	173
Table 26: Milk production costs and farm gate prices in 2016 in 5 EU countries (BAL/EMB 2016)	177
Table 27. Results regarding chain and VCA governance	187
Table 28. Results on transaction modalities	188
Table 29. Results on fairness of price	190
Table 30. Profitability, employment and employment conditions on farms	191
Table 31: Fair price results and breakdown per items	192
Table 32: List of criteria, indicators and reference points	199
Table 33: Our results compared with other studies	201
Table 34: Stakeholders and sub- categories of the Guidelines for S-LCA (Benoît and Mazijn 2009)	205
Table 35: Subclasses of capitals of the MCM Capacities S-LCA (Feschet 2014, 253)	205
Table 36: Comparison of results to highlight AFNs characteristics and claims	208
Table 37: Main features of the three applications	210
Table 38: Strengths and weaknesses of our framework	214
Table 39: The two CSR visions (Capron and Quairel-Lanoizelée 2015, 245–53)	224
Table 40: Comparison of various S-LCA frameworks or approaches. Adapted from (Feschet 2014a)	225

# INTRODUCTORY CHAPTER: CONTEXT, RATIONALE, AND SCOPE OF THE PHD

The conditions under which goods and services are produced and traded are globally not always safe and fair for workers involved. Poor working conditions affect even a large proportion of workers worldwide, according to the numerous reports from the International Labor Organization (ILO). Working conditions are especially hazardous in activities located at upstream nodes of product chains, such as in the mining and agricultural sectors (ILO 2009), but all stages of **life cycles of products and services** are likely to be concerned, from raw material extraction and production through processing, distribution and end-of-life treatment. At the use stage, consumers are also likely to be impacted (e.g. consumer health impacted positively when the product satisfies a basic need or negatively when eating food containing residues of pesticides). Also, other stakeholders can be impacted by product life cycles, while not directly involved therein, such as communities living in areas where specific goods are produced or used (e.g. communities living where jobs are generated by product life cycles or where production activities – such as mining – maintains or contributes to armed conflicts).

All issues of this kind can be widely embraced under what is called the **social sustainability of products and services**, i.e. how product life cycles affect people. The social sustainability of products and services is the focus of a research community seeking to develop a dedicated assessment tool for more than a decade. This tool is the **Social life cycle assessment (S-LCA)**. This tool is developed with the idea to complement assessments made with **Environmental LCA (E-LCA)**, which is a largely recognized and used tool focusing primarily on how life cycles of products (and services)<sup>1</sup> affect the environment<sup>2</sup>, with the ultimate objective being to reduce related impacts. It is because of the large use and of the benefits offered by E-LCA and because social issues in product chains are also particularly serious that S-LCA seems a relevant research area (cf. following section 1.). Beyond those down-to-earth reasons to develop S-LCA, the S-LCA research topic emerged following the priorities announced at the international policy level for social issues, in addition to environmental ones and for improving the sustainability of our production and consumption modes, with companies having particular responsibilities therein (cf. 2). Following the few first publications on S-LCA, the **Guidelines to conduct S-LCA** were published in 2009 (Benoît and Mazijn 2009). However, there is as yet no common and agreed framework and method among the research community and the further development of S-LCA requires research at several levels, given inherent differences implied by the two tools. This PhD aims to contribute to the development of a streamlined S-LCA methodological framework (cf. 3).

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<sup>1</sup> In the rest of the manuscript, we will generally refer to products, in order to refer to products and services.

<sup>2</sup> E-LCA assesses their impacts on people as well, but, broadly, only those occurring through physical inputs used in and generated by product life cycles. We will come back to this differentiation point later in the introduction.

# 1. Why is it relevant to develop S-LCA? Its down-to-earth/empirical roots

## 1.1 E-LCA: main principles and benefits

### 1.1.1 Life cycle thinking

The objective of E-LCA is to assess environmental impacts linked to the various life cycle stages of products, from product design and resource extraction till the end-of-life of products (cf. Figure 1). The tool is based on the life-cycle thinking approach, which advises to consider production stages, but also stages of use, repair, recycling, or waste treatment. If necessary, practitioners can limit the scope of their study and focus on particular life cycle stages (this is specified when system boundaries are defined). This means that impacts of all included stages together are looked at, in a holistic way. This life cycle thinking approach is particularly relevant in today's highly fragmented supply chains, with more and more processes outsourced (and even offshored) to other entities together with their related environmental (and social) impacts (cf. 1.2.3).

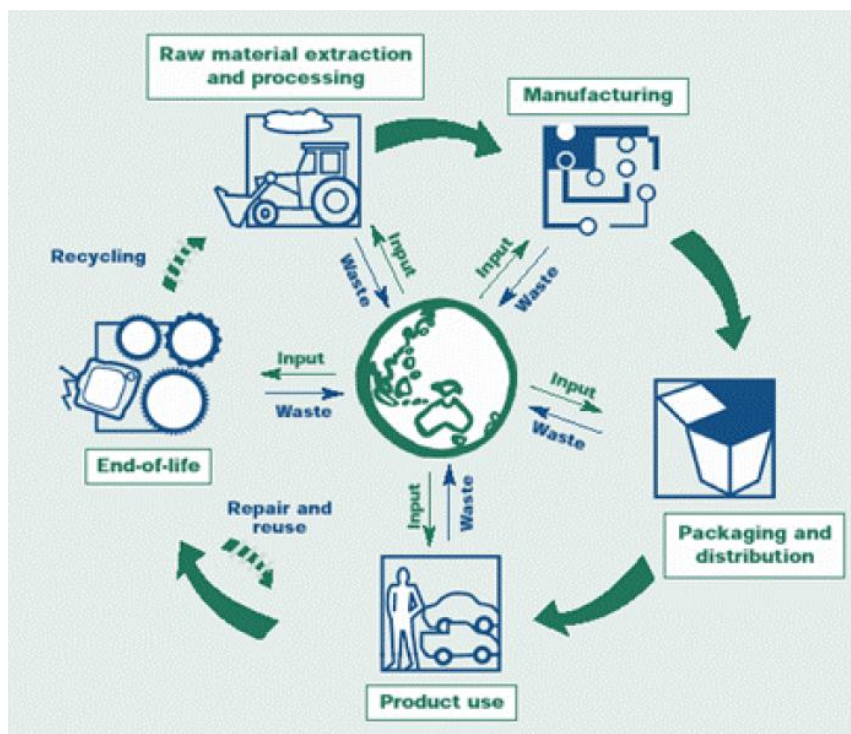


Figure 1: Stages of product life cycle (Australian Government in (Life Cycle Initiative 2005))

### 1.1.2 Impact pathways linking flows to environmental problems and damages

E-LCA is designed to consider all physical flows of materials and energy relating to the life cycle of products, which are then translated into emissions and environmental problems (e.g. global warming) on the basis of characterization factors or coefficients. It aims to cover a maximum number of impacts, as shown in the second column of Figure 2 below, representing one of the main E-LCA method (RECIPE).

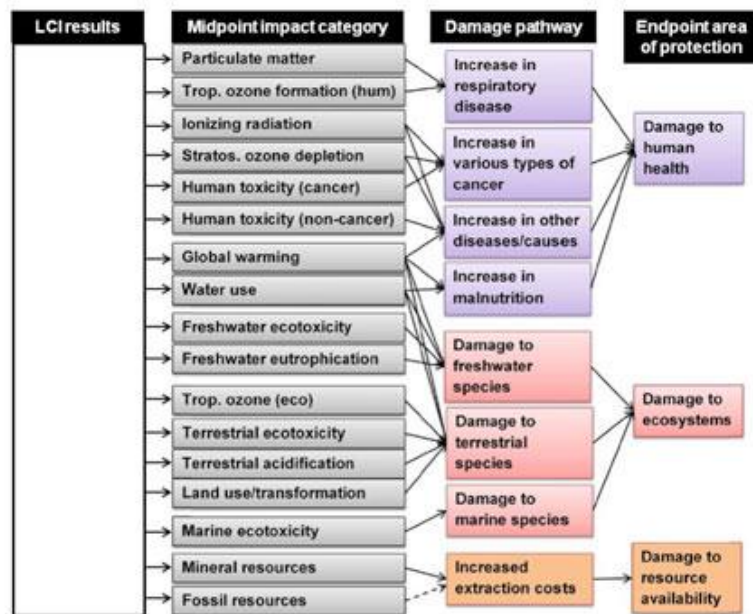


Figure 2: The impact assessment method RECIPE2016 (PRé Sustainability 2017)

After defining the goal and scope of the study (which is the method 1<sup>st</sup> step, see Figure 3), a second practical step is thus to inventory all physical flows and emissions, whose impacts are then assessed (third step), with specific methods such as RECIPE. From those environmental impacts or problems assessed at a so-called “midpoint” level, it is possible to assess “endpoint” impacts or damages on so-called areas of protection (AoPs): human health, ecosystems and resource availability. Characterization factors linking flows to environmental problems and to damages on defined AoPs are based on known and quantified impact pathways (e.g. the link between the combustion of gasoline and the emission of CO<sub>2</sub> which in turn affects potentially global warming and the availability of fossil resources (among others), impacting finally the three AoPs through different pathways). The impact assessment method RECIPE and other similar methods gather those already established characterization factors which are used by practitioners to assess potential impacts of specific products. Even though E-LCA is a consolidated tool, researches are still ongoing to make models more comprehensive and to integrate other impact pathways and characterization factors, as it is done for example for biodiversity impacts, for which further researches are required.

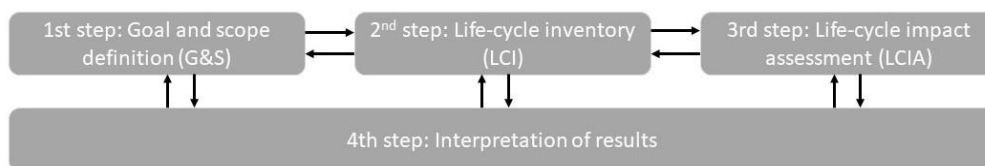


Figure 3: LCA steps (author)

### 1.1.3 The expression of impacts to a functional unit for various comparison uses

In E-LCA, impacts of products are expressed in relation to a functional unit (e.g. impacts of the weekly provision of protein needs of one household with x kg of meat). In this way, impacts of different life cycle stages can be compared (feed production and livestock farming) and hotspots for the various environmental problems can be identified. Thus, E-LCA can be used **internally by companies to identify the most impacting processes that require actions** for the environmental footprint of products to be reduced. This is the primary use of E-LCA (Jolliet 2010).

Additionally, E-LCA can be used to compare impacts of similar products from different companies (using different technologies or inputs) and of functionally equivalent products (e.g. animal- or vegetal-based weekly provision of protein needs for one household). Finally, E-LCA is used in eco-design to compare impacts following a modification in production processes and to identify potential displacements of impacts between life-cycle stages (e.g. from use to end-of-life in the case of shifting from fossil fuel-based to electric vehicles) and between impact categories (e.g. from air pollution to resources use). In this way, tradeoffs and potential “false solutions” can be identified, and their implementation avoided.

E-LCA can be used by companies to improve processes and make them less harmful for our environment and societies and to label their products (e.g. as done with the carbon footprint or with the Environmental product declaration). It can also be used by public authorities for marketing authorization of products and environmental taxations (Jolliet 2010).

Given these contributions of E-LCA to the environmental assessment of products, it seems relevant to develop such a tool for social issues, which are, as environmental issues, quite serious.

## ***1.2 The seriousness of social issues in product chains***

Poor working conditions in product chains have been until now the primary focus of the S-LCA research community (Di Cesare, Silveri, et al. 2016; Jørgensen et al. 2007), even if product life cycles have implications on other stakeholders, including negative (e.g. affecting health and safety of consumers and local communities) and positive ones (e.g. providing livelihood through jobs, providing utility through product use, generating taxes for public authorities). This is because poor employment and working conditions are a serious issue; it affects a large proportion of workers worldwide, improvements are globally weak and new forms of employments make new problems emerge, also in more advanced economies.

While this research work does not exclude other stakeholders of- or affected by the life cycle (e.g. local communities or final consumers) frontally, it focuses primarily on issues affecting workers, as most S-LCA studies. Apart from the consumption stage, workers intervene indeed at all life cycle stages, from the extraction of raw materials to the end of life. Also, in the current era of abundance of consumer's goods and of structural unemployment in most advanced economies, the power relationship is clearly in favor of consumers. For most goods and services, consumers have a large choice of buying options. On the other side, workers seem to be in a less favorable situation and their livelihood relies on their job. It seems thus important to uncover unfavorable employment and working conditions, as well as to understand their drivers and consequences, especially given the longstanding problems affecting workers in production chains worldwide.











### **1.2.1 Long-terms trends: poor employment and working conditions are (still) significant**

While the globalization of supply chains brought a number of jobs in emerging and now developing economies in the last decades, poor conditions still concern a large number of workers.

A “chronic poor-quality employment”. 42% of workers are in vulnerable employment worldwide, i.e. they are own-account and contributing family workers, who have limited access to contributory social protection schemes (ILO 2017b). Workers in emerging and developing economies take the lion's share, with respectively almost one in two and four in five workers and with women always more affected than men (cf. Table 1) (ILO 2017b). While up to 2012 vulnerable employment rates used to decrease, progress has stalled since then, so that the ILO refers to “chronic poor-quality employment” (ILO 2018).



Table 1: Vulnerable employment and working poverty trends and projections, 2007-2019 (ILO 2018)

	Vulnerable employment rate 2007–19 (percentages)			
	2007–16	2017	2018	2019
<b>WORLD</b>		<b>42.5</b>	<b>42.6</b>	<b>42.7</b>
Developed countries		10.0	9.9	9.9
Emerging countries		46.2	46.2	46.3
Developing countries		76.5	76.4	76.4
	Extreme working poverty rate 2007–19 (percentages)			
	2007–16	2017	2018	2019
<b>Total emerging and developing countries</b>		<b>11.2</b>	<b>10.7</b>	<b>10.2</b>
Emerging countries		7.7	7.2	6.7
Developing countries		41.2	40.1	38.9
	Moderate working poverty rate 2007–19 (percentages)			
	2007–16	2017	2018	2019
<b>Total emerging and developing countries</b>		<b>16.0</b>	<b>15.5</b>	<b>15.1</b>
Emerging countries		14.7	14.1	13.6
Developing countries		26.2	26.2	26.2

Source: ILO Trends Econometric Models, November 2017. Notes: 2017: preliminary estimates; 2018 and 2019: projections. Moderate and extreme poverty rates refer to the shares of workers living in households with income and consumption per capita between US\$1.90 and US\$3.10 per day, in purchasing power parity (PPP), and less than US\$1.90 per day (PPP), respectively.

**Human rights violated.** Almost one in ten children in the world works, with half of them in hazardous working conditions. This rate is even higher in sub-Saharan Africa, followed by Asia, the Pacific and the Americas. Their number is decreasing, but, again, more slowly in recent years (ILO 2019a). Child labor occurs primarily in agriculture (71%), services and in the industrial sector, incl. mining (ILO 2017c).

Forced labor is still an issue in every region of the world and it regards 25 million people. Among them, 16 million were in the private economy (with the rest being in forced sexual exploitation and in forced labor imposed by state authorities), in domestic work, construction, manufacturing and agriculture. The prevalence is the highest in Asia and the Pacific (4 per 1,000 people), followed by Europe and Central Asia, Africa, the Arab States and the Americas (ILO 2017d).

**Work is often underpaid in developing countries and is a source of inequalities across countries.** Working poverty affect a large number of workers. It can be caused by too low numbers of working hours, with (involuntary) part-time and temporary jobs (as in Europe (Lohmann and Marx 2018)) or by too low occupational incomes in countries with no or too-low minimal wages. Measured with the ILO working poverty rate<sup>3</sup>, it amounts 21%. This rate has decreased from 48% in 2000, however, since 2013, progresses have stalled and this slow-down should continue in the next years (ILO 2019d).

These figures hide big disparities across regions. In developing and emerging economies, rates correspond to respectively 67,4% and 22,4% in 2017 (cf. Table 1) (ILO 2018). As a comparison, for

<sup>3</sup> i.e. the share of the employed living in households with a per capita income under US\$3.10 per day (regardless of the number of persons living in households and of the number of worked hours).

Europe and Central Asia, the ILO rate is as low as 2.2% (ILO 2019d). According to (Eurostat 2018), which defines working poverty using another threshold<sup>4</sup> (so both results cannot be compared), the EU-28 average reaches almost 10%, varying from 3.1% (Finland) to 18.9% (Romania). Additionally, women are likely to be more affected, since global gender wage gap is frozen at 27 points (ILO 2019a).

**Significant occupational health and safety issues.** Recent years witnessed major **industrial accidents**, including the collapse of the Rana Plaza building in Bangladesh, which killed around 1100 people and injured more than 2500 people and the Vale Dam Disaster in an iron ore mining complex in Brazil, killing more than 300 workers. Only big ones are reported in the media, however each year, 380 000 people die in occupational accidents, and 374 million people suffer from non-fatal occupational accidents (ILO 2019b, 1).

And occupational accidents represent only less than 15% of occupational deaths, the rest being caused by **diseases** (mainly circulatory systems diseases, work-related cancers and respiratory diseases) (ILO 2019b). Main factors of those diseases include “ergonomic factors, injury risk factors, particulate matter, gases, fumes and noise” (ILO 2019b, 4). Even if exposure risks to harmful physical, chemical, and biological agents are well known, almost all exposures to those agents continue to increase (ILO 2019b).

Work contributes significantly to global health problems, with 5 to 7% of deaths globally<sup>5</sup>, and there is no evidence of improvements: the number of work-related deaths grew even by almost 20% between 2014 and 2017 (Hämäläinen et al, 2017) (ILO 2019b, 3).

Again, poorest countries take the lion share of this occupational mortality and morbidity, with 65% of global work-related mortality occurring in Asia and rates of fatal occupational accidents per 100,000 workers being at least 4 times higher in Africa and Asia than those in Europe (Hämäläinen et al, 2017) (ILO 2019b). Men and migrants workers are at greater risk of suffering occupational injury (ILO 2019a).

One of the growing identified challenges are psychosocial risks which relate to “the way work is designed, organised and managed, as well as to the social context of work” (van den Heuvel et al. 2018, 4; ILO 2019c). These risks can result in mental health problems (work-related stress, burnout or depression), cardiovascular disease and musculoskeletal disorders. In Europe, the prevalence of those risks is high, and the phenomenon increases: “25% of workers say they experience work-related stress for all or most of their working time (Eurofound and EU-OSHA, 2014)” (van den Heuvel et al. 2018, 11). For stress, the most frequently cited causes are “job reorganisation or job insecurity, working long hours or excessive workload, and harassment and violence”(EU-OSHA n. d.).

### **1.2.2 Recent developments: wage employment weakens, non-standard employment multiplies**

Beyond long-term trends, new issues emerge on labor markets, in poor and wealthy countries: on one hand, wage employment is less and less dominant, with only about half of global employment, and 20% in Sub-Saharan Africa and South Asia. On the other hand, non-standard forms of employment (NSE) emerge, as described in the ILO “The changing nature of jobs” report. These employment forms can be embraced under the casualization phenomenon. It implies a loss of security and incomes for workers, with the rise of temporary and on-call work, and outsourcing of risks and responsibilities for companies, with the rise of multi-party- and dependent self-employment (cf. Figure 4) (ILO 2015).

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<sup>4</sup> Defined as the share of employed persons living “in a household with an equivalised disposable income below 60% of the national median equivalised disposable income (after social transfers) (Eurostat 2018).

<sup>5</sup> Figures should be viewed carefully given data quality on the issue (with frequent under-reporting) (ILO 2019b).

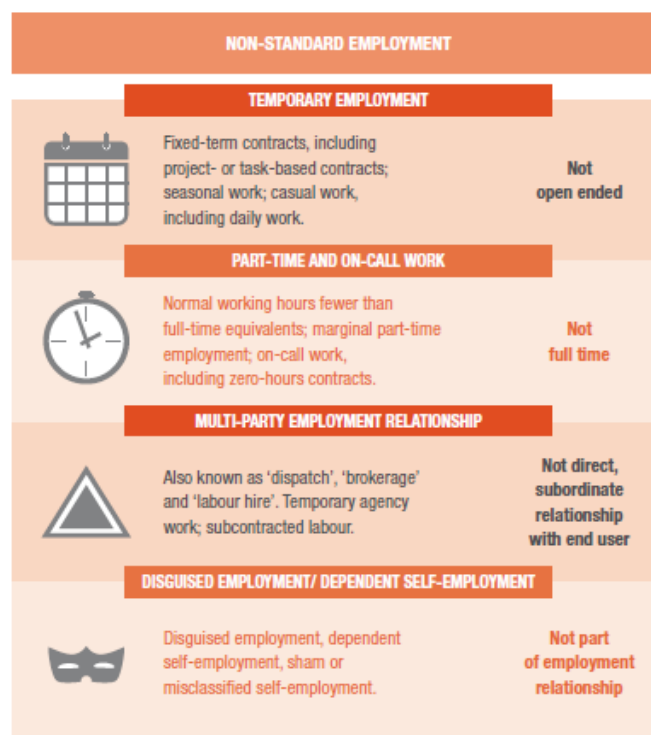


Figure 4: Non-standard forms of employment (ILO 2016)

**Main trends.** In **emerging and developing economies**, “the historical trend towards more wage and salaried employment is slowing down”, and “at the bottom of global supply chains, very short-term contracts and irregular hours are becoming more widespread” (ILO 2015, 13). Increasing NSE include casual employment (2/3 of wage employment in Bangladesh and India), dispatch, agency, subcontracted and outsourced work (35% of jobs in Indian manufacturing are contract labour). Also, there are some evidences that the reduction of vulnerable employment that occurred in the last years fueled the increase in NSE. This means that many workers formally involved in the informal economy are now involved in the formal economy but under NSE rather than wage employment (ILO 2016).

In **more advanced economies**, the standard employment model, “in which workers earn wages and salaries in a dependent employment relationship vis-à-vis their employers, have stable jobs and work full time” is decreasing, thus departing from historical patterns (ILO 2015, 13). In the EU-28, temporary employment accounts for 14.3% of total employment, including 62,1% that is involuntary” (9% in 1987) (ILO 2017b; 2016). In Spain, it reaches even 25% (ILO 2016). This increase has been enhanced by “policy reforms aimed at increasing labor market flexibility by facilitating the use of temporary employment” (ILO 2016, 56). NSE on the rise include dependant self-employment, temporary agency work, casual work (25% of employees in Australia), very-short hours (2,5% of British workers are under zero-hours contracts), on-call work (10% of workers in the US) and part-time employment, especially for women.

Another even more recent trend is the spreading worldwide of **digital labour platforms**, with Uber being the most known example. While facilitating labour demand and supply match and offering flexibility to workers in terms of working time, these platforms shift all risks to workers, who find themselves outside of labour and social protection coverage and who see their working and income conditions imposed unilaterally by the platform, outside national labour laws. These work practices can be linked to disguised employment and on-call work, and “allow for a far-reaching “personal outsourcing” of activities to individuals rather than to “complex businesses”, “resetting the boundaries of enterprises” (De Stefano 2016).

**Implications.** The NSE emergence reinforce the **segmentation or duality of labour markets**: workers of two segments perform the same type of jobs but benefit from very different employment conditions, and there is little crossover possibility for workers between the two segments. In some cases, it seems even that the conditions benefiting one segment are made possible at the expense of the other segment only: in companies of the garment and horticulture industries in Africa, Asia and South America that had to address new buyer demand for compliance to labor standards, a social upgrading is observed for regular workers, but not for irregular workers (Rossi 2011; Barrientos and Smith 2007).

These transformations may also influence the observed “**growing divergence between labour incomes and productivity**”<sup>6</sup>, with the latter growing faster than wages in much of the world” (ILO 2015, 13).

In addition to potentially lower incomes, social protection and higher insecurity, workers employed under NSE are more exposed to excessive working hours and overtime, atypical hours or work schedules. Also these are more likely to suffer from occupational injury and health issues (ILO 2016). Finally, the NSE development means that **risks are more and more outsourced from employers to employees**, this reminding the risk outsourcing from MNCs to suppliers stemming from outsourcing waves at the level of companies and supply chains (see below).

### 1.2.3 Context: developments of latest decades in product chains

According to ILO, one of the reasons for the proliferation of NSE across countries is to be found in the proliferation of global supply chains (GSCs), that has put countries and suppliers in fierce competition to attract respectively jobs and contracts, thus putting a downward pressure on employment conditions. This proliferation happened together with “several [other] overarching and interrelated tendencies” including the shift of labor from agriculture to manufacturing and then services, which require more flexible jobs; new technologies, facilitating globalization and the creation of new forms of jobs; macroeconomic conditions (incl. the 2008 crisis) putting companies and their workers under even more pressure; and subsequent evolving labour regulations implemented to accommodate all these changes and attract investments and jobs (ILO 2016).

**The process of proliferation of global supply chains.** More and more labor is concerned with GSCs: lately the participation in GSCs rose in most emerging and developing economies (Lee 2016). In 40 advanced and emerging economies, GSC-related jobs grew from 16.4% of total employment in 1995 to 20.6% in 2013 (ILO 2015). GSCs proliferate from the 80’s, at a time of industrial landscape evolution, in terms of geographic dynamic and in terms of firm’s nature and chain’s organization. This change in the industrial landscape developed with “common processes of financialization, technological revolution and stronger international competition” (Baudry and Chassagnon 2014, 104).

On one side, there has been a move of **horizontal integration** of firms at downstream levels of product chains, with a large move of merge and acquisition, but also franchises, strategic alliances and technological licences. This has led to the creation of multinational corporations (MNC) in developed economies and to oligopolistic situations with a concentration of power concentrated within retailers or processors (Baudry and Chassagnon 2014; Adda 2012; Locke 2013).

Regarding geographical dynamics, **production activities got internationalized**. While in 1970, 80% of manufacturing was taking place in developed economies, this share decreased to less than 60% in 2010, the rest being produced in developing Asian economies (32%, incl. 15% in China), and elsewhere in the world (10%). This move can be seen in foreign direct investments (FDIs) flows, which are, since 2010

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<sup>6</sup> Productivity is generally measured by the added value per labor unit.

and for the first time since 1945, directed in majority towards developing and eastern European economies, including China (10% of FDIs), Russia, Brazil, India, Saudi Arabia, Mexico, Turkey, and Chile (main recipient countries between 2005 and 2010). Behind those FDIs lie two strategies: penetrating local markets and benefiting from low-cost labor in order to re-export final products to wealthiest economies. Additionally, there has been a **specialization move**, with subsidiaries (or subcontractor, see below) producing more and more one particular component only of a final product (Adda 2012).

On the other side, firms encountered a **vertical disintegration** and ownership changed. Before the 80's, firms were generally vertically integrated, the model being one company owning the whole product chain on the Fordist model, and they were linked through conglomerates. Then, a change in the organization of production occurred, as explained by (Locke 2013, 10): "If in the past most manufacturing was carried out by domestic companies and their suppliers located within the same country or by vertically integrated multinational corporations (MNCs) headquartered in the advanced industrial economics (and thus subject to their regulations) that owned (fully or partially) their subsidiaries located in foreign markets, today, global production is organized primarily around global supply chains in which lead firms (brands, global buyers, large retail chains), although still based in the developed economies, are working with and coordinating the production of thousands of independent suppliers located for the most part in developing countries".

**Implications.** While the proliferation of GSCs is cited as one of the reasons behind the increase in job casualization both in advanced and developing economies, globalization brought some benefits in countries where production activities got offshored. In the last 40 years, moderate poverty decreased globally from 66 % of world population in 1981 to 46 % in 2015, and the real GDP per capita of developing economies increased greatly since 2000's. However, these figures hide big regional disparities with a large share of this progression being attributable to China's progresses (Roser and Ortiz-Ospina 2019; Adda 2012).

Income inequalities across countries, and particularly with the US, decreased for some countries (in chronological order, Japan, Asian newly industrialized countries<sup>7</sup>, China, India), but stagnated (Middle East) or increased for others (Latin America, Sub-Saharan Africa) (between 1950 and 2007).

In addition, inequalities between countries remain huge: Chinese and Brazilian earn 20% of the US average income in 2007, South Asian 8% and Sub-Saharan African 4% (Adda 2012, 161). When looking at global labour income distribution, inequalities are even more striking: "In 2017, the top earning [20%] received [69%] of total pay, whereas the remaining 80% of workers received just 31%" (ILO 2019e, 2) (cf. Figure 5).

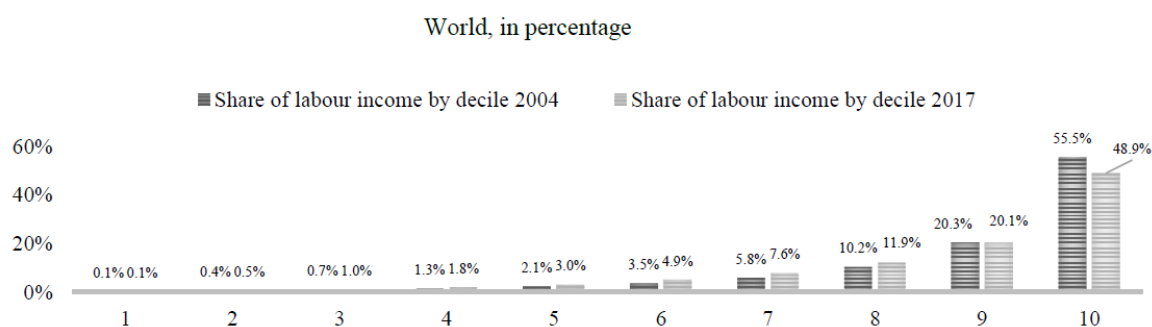


Figure 5: Labour income distribution by decile (ILO 2019e)

<sup>7</sup> 1<sup>st</sup> (South Korea, Taiwan, Singapore, Hong Kong) and 2<sup>nd</sup> generation (Indonesia, Malaysia, Philippines, Thailand)

Also, the offshoring of manufacturing and services jobs poses now problems to advanced economies: a structural long term unemployment took hold in continental Europe and there are more and more working poor in the US (Adda 2012, 222). Also, looking at within countries inequalities, trends in several high income countries (US, UK, Germany) show “a pattern of large gains for the top, coupled with losses for much of the rest of the distribution” (ILO 2019e, 5).

Thus, while the offshoring of production activities to certain developing countries brought benefits by reducing global poverty, it brought work casualization everywhere, it did not reduce inequalities substantially, and it brought more unemployment and a downward pressure on job quality in the North. Thus, it seems that “the competition from low-wages countries has rather resulted in a dumping down than in a levelling upwards of income conditions in the North and in the South” (Adda 2012, 228)<sup>8</sup>. However, these results are not surprising given the inherent globalization logic to run after lower costs and to benefit from living standards differentials between countries.

Employment and working conditions in GSCs are even more shocking when looking at the destination of goods produced: wealthy consumers of Western countries benefit directly from poor employment conditions offered to workers in the South.

**The GSCs significance and implications for social impacts.** And 18% of labor at global level is embodied in trade, as calculated by consumption-based accounting or footprinting researchers, meaning that related impacts “occur somewhere else to the consumption that drives them”. Yet, in this case, one can consider that associated impacts are “displaced away from the point of consumption” (Wiedmann and Lenzen 2018, 314).

With the offshoring of a large number of production activities to newly industrialized countries and China, there has been **a shift of social (and environmental) impacts**. When wages start growing (together with other impetus, such as infrastructures, business climate), global buyers look for other locations with even cheapest labor, as happened in the garment industry. After China, many brands started to work with South Asian suppliers (Cambodia, Vietnam, Bangladesh) and there is currently a move to Ethiopia, with wages 3 and 12 times lower than wages in Bangladesh and China respectively (Barrett and Baumann-Pauly 2019).

Thus, a number of low-skilled jobs and related impacts on workers **are continuously displaced**, to even more profitable locations for buyers and final consumers. While such an impact displacement can partly explain the rather small improvements of working conditions globally, it goes against the promise that the conditions under which goods are produced will improve gradually, with wages and conditions upgrading and catching up those prevailing in richer countries.

As a conclusion, problems in product chains are serious, and improvements are low or lacking. As the same time, implications and drivers of those problems are numerous, of different kinds and intertwined. While only focusing on problems for workers, this overview helps understand the relevance of developing a tool such as S-LCA. In the following section, we outline how S-LCA could contribute to the improvement of the social sustainability of products.

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<sup>8</sup> Own translation

### 1.3 Objectives and potential uses of S-LCA

According to the 2009 UNEP/SETAC Guidelines for S-LCA, “the ultimate objective for conducting a S-LCA is to promote improvement of social conditions and of the overall socio-economic performance of a product throughout its life cycle for all of its stakeholders” (Benoît and Mazijn 2009, 50). Also, improvements can be achieved through “[the provision of] information on social and socio-economic aspects for decision making, instigating dialogue among stakeholders” on those issues (Benoît and Mazijn 2009, 37). Those stakeholders or the audience of the study may include “the organization carrying out the study, trade unions and workers’ representatives, consumers, governments, NGOs, [intergovernmental organizations], shareholders, product designers” (Benoît and Mazijn 2009, 50).

Through a literature review (cf. chapter 3), we identified two main objectives and potential uses that are each achieved through two kinds of S-LCA results. The first one is the identification of the most impacting or risky processes within a product life cycle and/or the related issues, with the aim of improving the performances/potential impacts/potential risks (or the social sustainability)<sup>9</sup> of existing product life cycles. The second one is the comparison of social sustainability according to different scenarios with the aim of choosing the best option/scenario to be implemented/supported (cf. Table 2).

*Table 2: The two main objectives, potential uses and kinds of results of S-LCA studies (Author)*

Objectives and potential uses	Methods and results	Level of analysis/Focus
<b>Improving the social sustainability of existing product life cycles</b>	Identification of the most impacting/risky processes within a product life cycle and/or of the related issues	Specific product chains/life cycles and whole industries at national level/average
<b>Choosing the best option/scenario to be implemented/supported</b>	Comparison of performances/potential impacts/risks according to different scenarios	Ex-ante and ex-post assessment

#### 1.3.1 Improving the social sustainability of existing product life cycles

Similarly to E-LCA, S-LCA can help increase knowledge on social aspects of product chains and identify the most important problems that require actions. We have seen that working conditions at global level are well documented, yet, there is overall little information available to consumers, public authorities and even lead firms on specific product chains or on products from specific brands or origins. With globalization, most product chains have lengthened, production processes have been outsourced, and even offshored. Consequently, it is even more difficult to be aware of working conditions in supply chains or of problems affecting local communities during production processes, hence the usefulness of such a tool.

Assessments take place at two levels: i) specific product chains (e.g. tomatoes produced from a specific company); ii) national/average industries (milk production in Canada) or product chains (e.g. South African sugar industry). For those two focuses, data is collected either on site (specific data, generally for local processes) or with statistics/databases (generic data, especially for remote processes).

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<sup>9</sup> In order to be comprehensive and to embrace all the kinds of assessment made with S-LCA, we use the term “social sustainability” when referring to performances, potential impacts and potential risks assessed.

### 1.3.2 Choosing the best option/scenario to be implemented/supported

The existence and extent of those detrimental conditions potentially vary according to product chains. Some chains seek specifically to ensure decent working conditions, such as Fair trade chains, and some others seek to relocate production processes in order to avoid labor exploitation implied by North-South trade flows. It seems important to differentiate those initiatives (and others) from classical chains. This can be done through product's comparisons, to help consumers choose most sustainable products or public authorities to enhance their production and consumption, through various measures.

In addition to ex-post assessment (assessment of existing product chains), ex-ante assessments are also conducted. (Macombe and Falque 2013) argue that S-LCA should help anticipate the potential social consequences of a production choice, so that it can be used by managers for decision making. Concretely, S-LCA should be able to anticipate the consequences of the creation and cessation of a production activity, or of the change in the functioning of the activity (e.g. the introduction of a new technology, the restructuring of a company or the offshoring of a process). Thus, S-LCA should be able to assess potential social effects or impacts (e.g. job destruction or worker health impacts linked to automatization), rather than to merely report on social attributes of product life cycles (e.g. employment conditions). If S-LCA *reports* on an existing situation only, it is not possible to anticipate or to forecast consequences, and cannot be used for decision-making.

Against this background, (Macombe and Falque 2013) argue that S-LCA should compare two situations only (the reference situation and the final situation), or different alternatives that provides the same function. One main underlying objective of this assessment is to catch impact displacement that can occur following a change in the product life cycle. As with E-LCA, impact displacement can occur between life cycle stages and between impact categories, but also between stakeholders or groups of people (Macombe and Loeillet 2013). In the context of the major changes in product chains that occurred in the last decades and of simultaneous slow reduction of inequalities and job casualization, the identification of impact displacement seems even more important.

With this discussion, we can catch a glimpse of the methodological and further debates occurring within the S-LCA research community, and that we continue discussing in this PhD. Before entering into core discussions, we propose in the second section of this introductory chapter to look at the early stages of S-LCA and at the impetus that have made it emerge.



## 2. What is the rationale of research studies on S-LCA? Its conceptual roots

Following a few research studies seeking to introduce social aspects in LCA (O'Brien et al. 1996; Hofstetter and Norris 2003; Schmidt et al. 2004; Gauthier 2005; Manhart and Griebhammer 2006; Mazijn et al. 2004), the years 2005-06 mark the emergence of S-LCA as an own research area, with reference articles published in leading LCA journals (Weidema 2006; Norris 2006; Dreyer et al. 2005; Hunkeler 2006; Labuschagne, Brent, and van Erck 2005). In 2006, one of them (the International Journal of Life cycle assessment) launched a new subject area dedicated to "LCA-compatible societal assessments" (David Hunkeler 2006a). From 2010, international seminars on S-LCA were held regularly, with the first one held in Denmark (CIRAIG 2013).

In parallel, from 2004, a group of experts and researchers – mainly with engineering backgrounds - worked together on the future Guidelines for S-LCA in the framework of the Life cycle Initiative of the UN Environment Programme (UNEP) and the Society of Environmental Toxicology and Chemistry (SETAC) (Sakellariou 2016; Benoît et al. 2010). After 5 years of collaborative work by 40 researchers and experts, the UNEP/SETAC Guidelines for S-LCA<sup>10</sup> were published, providing a general framework to conduct S-LCA (Benoît and Mazijn 2009). Following the publication, the number of S-LCA articles took off, with around 35 case studies published in peer-reviewed journals between 2009 and 2015 (Petti, Serreli, and Cesare 2016).

Given this rapid development which took off from the mid- 2000's, we may ask about the impetus for researchers to start S-LCA research studies, especially at that time. When looking at the rationale put forward by researchers, it seems that the emergence of S-LCA has been enhanced by current discourse of UN bodies placing **sustainable development** at the forefront (2.1) and production and consumption modes as one main action area, with **companies having particular responsibilities** in this regard (2.2).

### *2.1 Sustainable development as a new development paradigm*

As a rationale for their work on S-LCA, S-LCA researchers refer broadly to the concept of **sustainable development as defined in the Brundtland report** and as supported by UN bodies from the 90's, to the specific interpretation made thereof that is the **3-pillar approach, and to the rise of** Sustainable consumption and production (SCP) as a new policy action area.

#### **2.1.1 The Brundtland report and its appropriation by UN bodies**

The Brundtland report who popularized the term Sustainable Development was produced by the World Commission on Environment and Development, which was itself set up in 1983 by the UN General Assembly, at the time of "African famines, the leak at the pesticides factory at Bhopal, India, and the nuclear disaster at Chernobyl, USSR", but also "more chronic, widespread disasters: the debt crisis, stagnating aid to and investment in developing countries, falling commodity prices and falling personal incomes". The demand for the UN General assembly was "A global agenda for change", in a context of "environmental degradation [...] (warming globe, threats to the Earth's ozone layer, deserts consuming agricultural land)" impacting particularly poor nations, and of "growing gap between rich and poor nations" (WCED 1987, 6–7).

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<sup>10</sup> Henceforward referred to as the 'Guidelines', 'S-LCA Guidelines' or 'UNEP/SETAC Guidelines'

The report sounds the alarm about both ecological and social crisis, bringing together both issues, but also highlights the role of the economy as a factor of the ecological crisis (implying a too high demand for resources and too much pressure on environmental load) and as a solution to the social crisis (necessary to meet human needs) (WCED 1987). It calls for a sustainable development, i.e. “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987, 41). This definition highlights, in the business as usual scenario, the limited resources and ability of the environment to meet population needs, while currently, a significant proportion of world’s population see their needs not satisfied. In this way, it calls for a “new era of economic growth [...] based on policies that sustain and expand the environmental resource base [...] [and which is] essential to relieve the great poverty that is deepening in much of the developing world” (WCED 1987, 41).

The Brundtland report and its sustainable development definition is often cited by S-LCA researchers as a rationale for expanding the assessment beyond environmental issues. However, S-LCA emerged later, especially following its adoption by the international community. “Sustainable development” was “institutionalized” with the UN Rio de Janeiro Earth Summit (1992) and its declaration of 27 principles that should guide “sustainable development”, as well as with following UN summits and initiatives, including the 2002 UN World Summit on Sustainable Development in Johannesburg (Purvis, Mao, and Robinson 2019).

### 2.1.2 The 3-pillar approach as a conceptual approach to sustainability in S-LCA

There are different interpretations of the terms sustainable development/sustainability<sup>11</sup>. However, S-LCA researchers generally refer to the **3-pillar approach to sustainability**, describing it as the sum of its environmental, social and economic dimensions, without mentioning the rationale underlying this choice (P. Feschet et al. 2018).

For example, the S-LCA Guidelines explicitly cite the 3-pillar approach to sustainable development, mentioned as the 3P’s (People, Planet, and Profit/Prosperity), as a “context within [which S-LCA] should be perceived” (Benoît and Mazijn 2009, 16). The 3P’s or triple bottom line concept was put forward by (Elkington 1998) for company’s accounting to consider long term impacts on people and planet, beyond financial objectives (Benoît and Mazijn 2009; Purvis, Mao, and Robinson 2019). In this context, while E-LCA is meant to assess the environmental dimension, the social and economic dimensions should be assessed respectively through S-LCA and Life cycle costing (or LCC, assessing costs along product life cycles); the addition of the three assessment forming Life cycle sustainability assessment or LCSA, as stated by (Kloepffer 2008b) and as took by the main UNEP/SETAC publication on LCSA (cf. Equation 1)<sup>12</sup>.

$$\text{LCSA} = (\text{environmental}) \text{ LCA} + \text{LCC} + \text{S-LCA}$$

*Equation 1: Formal equation describing LCSA (Kloepffer 2008b; Valdivia et al. 2011)*

<sup>11</sup> While some argue that meanings and implications of both terms sustainable development and sustainability can differ, most S-LCA researchers refer to both. We preferably refer to sustainability in the rest of this manuscript.

<sup>12</sup> There is a debate within the S-LCA/LCSA research community over the content of the economic dimension and the appropriate tool to assess. We can already perceive this debate in the UNEP/SETAC Guidelines for S-LCA and in the main UNEP/SETAC publication on LCSA, the former stating that S-LCA should assess the “people” and “profit/prosperity” pillars and the latter not mentioning the economic pillar when introducing S-LCA (Valdivia et al. 2011). We will come back to this issue later in the manuscript.

In addition to this broad formula, the consensus seems to be that “a formal weighting between the three pillars shall not be performed. [...] there is no (and shall never be) any compensation between the pillars”, as stated in (Kloepffer 2008b, 93), which is seen as a reference (Valdivia et al. 2011). However, no further explanation on the rationale underlying this formula and on the potential relations between the three pillars is provided in main LCSA related publications (Kloepffer 2008b; Valdivia et al. 2011). This situation can be explained by the lack of “theoretically solid conception” underlying the 3-pillars and by the fact that the 3-pillars approach “has been presented as a ‘common view’ of sustainable development (Giddings et al. 2002), so commonplace it seems not to require a reference” (Purvis, Mao, and Robinson 2019, 685).

### 2.1.3 Sustainable consumption and production (SCP) as a new policy area

To reach the ultimate objective of sustainable development, the elimination of “unsustainable patterns of production and consumption” is seen as a major lever, as stated in the 1992 Rio Declaration (UNCED 1992b). In the published Agenda 21<sup>13</sup>, a whole chapter is dedicated to SCP (UNCED 1992a), which is defined later as “the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations” (UNEP 20117). At the 2002 World Summit, a 10-year work programme<sup>14</sup> is launched to support regional and national initiatives aimed to make consumption and production more sustainable. Later, the 12<sup>th</sup> Sustainable Development Goal (SDG) will be devoted to SCP (UN n.d.). At the EU level, an action plan for SCP and Sustainable Industrial Policy (EC 2008) is set up in 2008 (Zaccaï and Haynes 2008; Benoît and Mazijn 2009).

It has to be noted however that within SCP related initiatives, sustainability is mainly thought in terms of environmental sustainability, and within SDGs, decent work is mentioned separately in the 8<sup>th</sup> objective (together with economic growth) (UN n.d.).

In the context of SCP, **LCA is seen as one of the approaches** to support the development of production and consumption policies that help “improve the products and services provided, while reducing environmental and health impacts”, as stated in the Johannesburg plan of implementation (UN 2002, 7). The UNEP/SETAC publication on LCSA (Valdivia et al. 2011) is itself said to aim specifically to contribute to the 2012 UN conference, with the journal article announcing the publication being titled “A UNEP/SETAC approach towards a LCSA—our contribution to Rio+20” (Valdivia et al. 2013).

This rise of SCP as a new policy area happen after a thirty-year of continuous economic growth and just after the beginning of globalization, which both impacted the natural environment, did not reduce North-South inequalities and for the latter implied job losses in Western economies (Zaccaï and Haynes 2008). This period has also seen the crumbling of Fordism and accompanying paternalist human resources management, and of the Welfare state from the 80’s. This all has led to a loss of legitimacy and trust towards companies but also to the rise of civil society lobbying groups (NGOs, new social movements) condemning companies’ practices towards their workers and the environment. These empirical developments have fostered the emergence of the managerial paradigm of Corporate social responsibility (CSR), reconfiguring the role that companies should have in society, or as a way to regain legitimacy for big companies (Capron and Quairel-Lanoizelée 2015).

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<sup>13</sup> Agenda 21 is an action plan to be taken at various levels by organizations to achieve sustainable development.

<sup>14</sup> Called the 10-year Framework of Programmes on SCP, which became the Marrakech Process in 2003.

## 2.2 Corporate Social Responsibility as the managerial paradigm

The recognition of the responsibility of companies in SCP has fostered CSR as a new management area for MNCs (cf. 2.2.1 and 2.2.2) and the emergence of regulations to enforce this responsibility (2.2.3), all those developments having fostered in turn the emergence of S-LCA (and the boosting of E-LCA).

### 2.2.1 The stakeholder theory and the alternative responsibility assigned to enterprises

The issue of the companies' responsibility towards society was however not a new one. The role taken by companies towards society evolved over time, from patronage (before industrialization) to paternalism (end of 19<sup>th</sup> century-20's), and to a more regulated context for companies (until the 70's). The academic debate thereupon started in the US from the beginning of the 20<sup>th</sup> century following the rise of 'big business', with publications of Berle and Means (1932), Bowens (1953), and Davis (1960). However, it is the stakeholder theory of Freeman (1984) that boosted the nowadays CSR concept (Capron and Quairel-Lanoizelée 2015), and that also influenced S-LCA (Feschet 2014).

The **stakeholder theory** configures an alternative role for companies, away from the orthodox view considering the role of companies to be constrained to increasing profits and to serving shareholders' interests, as argued e.g. by the Agency theory and by the lead economist Friedman with his known claim "the social responsibility of business is to increase its profit" (Friedman 1970). Conversely, Freeman argues that companies should take into account interests of stakeholders, i.e. those impacting or being impacted by its decisions, including their employees, clients, suppliers and communities, in addition to those of shareholders. With a rather pragmatic approach, he argues that their interests and expectations should be understood and integrated in companies' management in order to ensure their durability and profits in the long term (Bonnafeous-Boucher and Rendtorff 2014; Capron and Quairel-Lanoizelée 2015).

The stakeholder view is often referred to as **the theoretical basis on which S-LCA is based**, as described in the 2009 S-LCA Guidelines. As main evidences of this statement are the focus on the practices of life cycle organization in the assessment criteria, and the classification of those, based on stakeholders impacted by life cycle organizations (or by the lead firm), i.e. workers, final consumers, value chain actors, local community, society (cf. Figure 6).



















Stakeholder categories	Impact categories	Subcategories	Inv. indicators	Inventory data
Workers	Human rights			
Local community	Working conditions			
Society	Health and safety			
Consumers	Cultural heritage			
Value chain actors	Governance			
	Socio-economic repercussions			

Figure 6: Assessment system from categories to unit of measurement in the UNEP/SETAC Guidelines for S-LCA (Benoît and Mazijn 2009, 49)

In line with the stakeholder theory, companies started integrating Corporate social responsibility into their management through various voluntary tools from the 90's, in order to address the growing pressure they face and to regain legitimacy, before the rise of binding regulations in recent years.

### 2.2.2 A first application: the move of voluntary CSR since the 90's

**What is CSR?** The **EC defined** CSR as “a concept whereby enterprises integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis. It is about enterprises deciding to go beyond minimum legal requirements and obligations stemming from collective agreements in order to address societal needs” (EC 2006). As just outlined, CSR gathers voluntary initiatives, techniques and tools only (what can be gathered under “soft law”, i.e. regulation which do not have any legally binding force), while it could have been operationalized differently through compulsory policy schemes (“hard law”, cf. below).

These **CSR initiatives, techniques and tools** include i) standards and labels, such as SA 8000 (Social Accountability International, 1989) for labelling purposes; ii) reporting guides, such as the widely used Global reporting initiative (UNEP/CERES, 1997), to support companies in the monitoring of their practices; but also iii) initiatives, such as the Global compact (UN, 1999), through which companies commit to work on specific issues (Benoît and Mazijn 2009). In 2010, the International Standard Organization (ISO) published a voluntary guidance standard on social responsibility (ISO 26000) “to assist organizations in contributing to sustainable development” (ISO 2018, 6). ISO 26000 addresses seven core subjects: organizational governance, human rights, labour practices, the environment, fair operating practice, consumer issues, community involvement and development (ISO 2018).

As outlined by the ISO definition, from the 2000's, companies integrated the concept of sustainable development to the CSR concept, both being nowadays highly linked, at least in Europe, and CSR reports being called either **CSR or sustainability reports** (Quairel and Capron 2013).

As part of the CSR movement, a number of standards and labels have been created in the last 30 years, also covering social sustainability aspects (e.g. Rainforest Alliance, FSC or Fair trade labels, see Box 1) (Feschet 2014). In addition to these multi-stakeholders tools and initiatives intended to involve or to be used by several companies, companies configure increasingly their own private charters or codes of conducts, whose compliance is monitored through social audits implemented by the companies themselves in their supply chains, whose contents are yet various and unequal (Subramanian 2019; Capron and Quairel-Lanoizelée 2007, 69).

#### *Box 1: Fair trade labels and brands*

While Fair trade labels and brands can be assimilated to the number of initiatives created with the CSR move, the roots of the movement date back to the 50-60's in Europe, which makes it quite different from CSR voluntary initiatives (WFTO 2015). The civil-society movement emerged in order to improve producer livelihood in developing countries by supporting the selling of products under fairer conditions than conventional trade, i.e. by ensuring a fair price and long term trading relationships, which are seen as a prerequisites to reduce detrimental environmental and social impacts. In this way, “Fair Trade is not charity but a partnership for change and development through trade” (World Fair Trade Organization and Fairtrade International 2018, 18).

Today, 1.66 million of farmers and workers work in a fair trade cooperative globally, and sales of fair trade food and handicraft products reached 9 billion in 2017 (Fair trade Belgium 2017). However, in spite of its widespread use and recognition, there is a recent trend among brands towards giving up the fair trade label to use in-house sustainability standards, as shown by the recent move of Sainsbury and Mondelēz (Subramanian 2019).

In the same vein, **Belgian authorities** acted as a pioneer with the creation of a **social label** in 2002 in order to promote “socially responsible production”, so that final products (and not companies) that are produced by companies respecting the principles of the ILO 1998 Declaration on Fundamental Principles and Rights at Work<sup>15</sup> can be differentiated. The impact and use were, however, limited: only 6 companies were labelled for a product or a service in 2009 (Glorieux 2009). The product-focus of the label complicating the certification process (especially with globalized supply chains), the lack of credibility of control mechanisms, the costs (to be paid by companies) and the lack of promotion on the label towards consumers are among the main reasons cited for this disinterest (Morenville 2003; Glorieux 2009; Giuliano and Dupont 2013).

**Use and impacts of voluntary CSR. CSR has been integrated** in the discourse, and sometimes in the management of companies, with 95% of world biggest companies publishing a sustainability report in 2011 (32% in 1999) (Capron and Quairel-Lanoizelée 2015). This move towards voluntary CSR was furthermore largely supported by the EC and its member states (EC 2001; 2006; 2011; Capron and Quairel-Lanoizelée 2015). Yet, the movement is limited to big companies and their motivations are mainly financial. Being voluntary initiatives, there is no requirements for those, including on issues and entities in the value chain to be covered. This means that CSR content varies according to companies, firms’ strategy “going from philanthropy to the integration of social and environmental concerns in their management and assessment systems” (Capron and Quairel-Lanoizelée 2007, 19)<sup>16</sup>.

Since 2014, there is an **EU directive on non-financial reporting** (EC 2014), which obliges biggest public-interest entities (i.e. around 6000 companies) to report on “their policies [...], risks and results regarding environmental, social and human resources, respect of human rights and fight against corruption issues” (Capron and Quairel-Lanoizelée 2015, 194). This directive is however rather flexible given the number of exemptions and since companies chose themselves what they report on (Capron and Quairel-Lanoizelée 2015). This is despite existing tools available such as the UN Guiding Principles Reporting Framework which could have been used (ECCJ and Clean Clothes Campaign 2019).

On top of - or because of - the mentioned shortcomings of voluntary CSR, **its impact** on the improvement of practices is called into question, particularly when looking at the lack of or low social and environmental improvements made effectively globally (Lock and Seele 2016; Quairel and Capron 2013). Academics have shown the inefficiency of codes of conduct and social audits organized by big buyers by their suppliers to improve working conditions, those entailing mainly monitoring and reporting, without questioning own purchasing practices (Kelly et al. 2019; Locke 2013; Barrientos and Smith 2007). As highlighted by a recent NGO report gathering body of evidence produced by researchers and campaigners, *“brands continue with an oversight system that essentially locates the prime responsibility for code compliance at the factory level, willfully ignoring the role that their own purchasing practices, design and sourcing decisions play in fueling worker abuses and constraining the possibility for meaningful remedial action”* (Kelly et al. 2019, 6).

As a consequence, calls of civil society to implement binding regulations such as so-called human rights due diligence (HRDD) are increasingly heard.

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<sup>15</sup> i.e. freedom of association and effective recognition of the right to collective bargaining, elimination of forced labour, abolition of child labour and elimination of discrimination in respect of employment and occupation.

<sup>16</sup> Own translation.

### 2.2.3 The recent emergence of binding CSR policy initiatives: Human rights due diligence

**Rise of the concept.** Due diligence should prevent adverse social impacts: it is “a way for enterprises to proactively manage potential and actual adverse human rights impacts with which they are involved” and it implies first to “identify and assess risks by geographic context, sector and business relationships throughout own activities (both headquarters and subsidiaries) and the value chain” (OHCHR 2011).

At UN level, several official texts refer to corporate social responsibility and accountability (UN 2002; ILO 2017a)<sup>17</sup>. In 2008, the Guiding principles on Business and Human Rights (OHCHR 2011)<sup>18</sup> introduce the HRDD notion (Rigot 2019; Capron and Quairel-Lanoizelée 2015). However, it is only after the Rana Plaza collapse and the lack of accountability demonstrated by concerned buyers that the idea of a binding treaty relating to HRDD emerged. Following calls from civil society, South Africa and Equator proposed in 2013 a resolution at the UN Human Rights Council, which was adopted despite EU and US opposition, and a dedicated intergovernmental working group<sup>19</sup> was created. Its work is still ongoing, with some progresses registered since 2014 and the support of the European Parliament (Capron and Quairel-Lanoizelée 2015; 11.11.11 et al. 2019).

**A new wave of regulations.** At EU level, a HRDD binding regulation now exists for conflict minerals, i.e. specific minerals coming from areas with (potential) conflicts: from 2021, importers will have to guarantee that these do not fund conflict or other illegal practices (EP and Council 2017).

As a pioneer, France went a step further with its law on duty of diligence/care of MNCs (parent companies and main/sourcing companies)<sup>20</sup> (Legifrance 2017), which requires the 150 biggest enterprises<sup>21</sup> to ensure that their subsidiaries and suppliers respect human rights, corruption law and the environment. To do so, companies must provide a yearly plan to prevent risks (e.g. of injuries, of underpayment). If there is no plan or if it is considered insufficient, the company can be judged responsible, particularly in case of damages.

And the French initiative seems to spread, with “several experts conclud[ing] that there is a gradual evolution from soft law to hard law [...] [though] this is still an unstructured and uneven process” (Huyse and Verbrugge 2018, 9). For example, the Netherlands adopted a similar law on child labor in 2019, initiatives are underway in Germany and Denmark and several countries made statements in this direction (ECCJ 2019). However, in Belgium, the action plan (CIDD 2017) is judged not comprehensive and ambitious enough, with a mere focus on voluntary initiatives (Huyse and Verbrugge 2018, 10).

**Efficient tools?** While victims of damages should be compensated more easily with those regulations, the burden of proof falls on them, with all the known difficulties to trace the parent company back, if a subsidiary or a supplier is accused. In addition, these laws impose an “obligation of means” rather than of results and their efficiency to prevent damages rely on what companies will implement. In the French

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<sup>17</sup> The Johannesburg Action plan includes a commitment to “enhance corporate environmental and social responsibility and accountability” (UN 2002, 8). The Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy (ILO 2017a) (adopted in 1977, revised in 2017) promotes the respect of ILO conventions on human rights at work and is “the only international tripartite text regarding MNCs to be applied universally [...] but as non-binding, has a declarative value only” (Capron and Quairel-Lanoizelée 2015, 128).

<sup>18</sup> The Guiding Principles on Business and Human Rights: Implementing the United Nations 'Protect, Respect and Remedy' Framework" were adopted by the UN Human Rights Council in June 2011.

<sup>19</sup> “Transnational corporations and other business enterprises with respect to human rights” working group

<sup>20</sup> Propre traduction. Loi n° 2017-399 du 27 mars 2017.

<sup>21</sup> i.e. with more than 5000 workers in the country

law, companies will have to produce a yearly diligence plan<sup>22</sup>: concretely, a company will have to implement regular audits in its subsidiaries and in suppliers' plants to check whether it respects e.g. UN conventions but the efficiency of social audits is called into question (cf. 2.2.2 *Use and impacts of voluntary CSR*).

Thus, the question remains: if monitoring and reporting contribute little to improve sustainability, what can be implemented by companies to make products and their chains more sustainable?

**S-LCA to feed CSR?** It seems that S-LCA, could or should be able to help bringing replies to this question. S-LCA could for example help understand why some products and processes provide better working and employment conditions or induce less occupational injuries. The levers identified could then feed the content of those voluntary initiatives and binding mechanisms and thus S-LCA could act as a complementary tool.

However, S-LCA has until now mainly been used as a reporting tool, including under the influence of the CSR move. Indeed, while the rise of CSR as a managerial paradigm boosted the development of S-LCA (Sakellariou 2016), this influence was not completely positive, as argued by (Macombe and Falque 2013), calling mainstream S-LCA as "Life-cycle CSR" and by (Feschet 2014) who formulates a whole critics towards CSR in relation to S-LCA:

*« CSR is not able to adopt a systemic approach and to grasp global stakes imposed by ecological and social crisis. On one hand, the approach is empirical and do not consider social dynamics; this leads to a squeezed representation of the company, of its role, its environment and its sphere of influence.*

*Against this background, the issue of sustainable development is addressed with an incomplete and disaggregated approach (Lankoski 2009), while it is inherently global and dynamic. On the other hand, the issue, as well as underlying crisis, implies to rethink deeply the modes of organization, governance and production, and not to reproduce existing logics" (Feschet 2014, 40)<sup>23</sup>.*

**As a conclusion**, conceptual roots of S-LCA are to be found in sustainable development and CSR which have both been interpreted, institutionalized by the international community for the former and applied by companies and recently by public authorities for the latter. These interpretations and uses seem to have shaped the content of mainstream S-LCA. With this PhD we continue investigate the conceptual roots of S-LCA, with the main aim being to address some of the main related methodological challenges.

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<sup>22</sup> The yearly diligence plan should include a risk cartography, a regular assessment procedure of suppliers, tailored actions to mitigate risks and to prevent rights violation, alert and monitoring mechanisms (Héraud 2016)

<sup>23</sup> Own translation.



### 3. Why a PhD on S-LCA? The rationale and scope for this research

S-LCA entails several methodological challenges, that justify the carrying out of a research work on it. Before explaining these challenges and detailing our research questions, we seek to locate S-LCA in the landscape of (social) assessment tools, disciplines and epistemological paradigms.

#### 3.1 S-LCA: a distinct tool, falling between two stools

##### 3.1.1 The specificity of S-LCA in relation to other (social) assessment tools

What differentiates S-LCA from other “social” assessment tool is the **life cycle thinking** approach adopted, meaning that as much as possible stages of product life cycle (from raw material extraction to product end-of-life) must be considered (cf. 1.1.1 of this introduction). If the full life cycle is not considered and a specific stage is not taken into account, it is mentioned when setting the **system boundary**: in that way, the possible occurrence of impacts at other life cycle stages - or the possible transfer of impacts to other life cycle stages – is acknowledged. Also, when impacts are linked **to a functional unit**, it becomes then possible to compare impacts between life cycles stages and between products with the same function.

This is not the case of other social assessment tools which focus generally on **specific and single objects**, let it be sites (Social impact assessment or SIA) or enterprises (CSR) (cf. abscissa of Figure 7). Some CSR tools go beyond the enterprise level, but most of them “stop their assessment at the 1<sup>st</sup> tiers of suppliers” (Benoît and Mazijn 2009, 42). For its part, S-LCA aims on one hand to focus on most of the product life cycle, comprising several (and possibly all) processes, facilities and enterprises involved in the life cycle of the assessed product.

Those distinct features and benefits of S-LCA in comparison to other social assessment tools should be kept in mind when working on its methodological development.

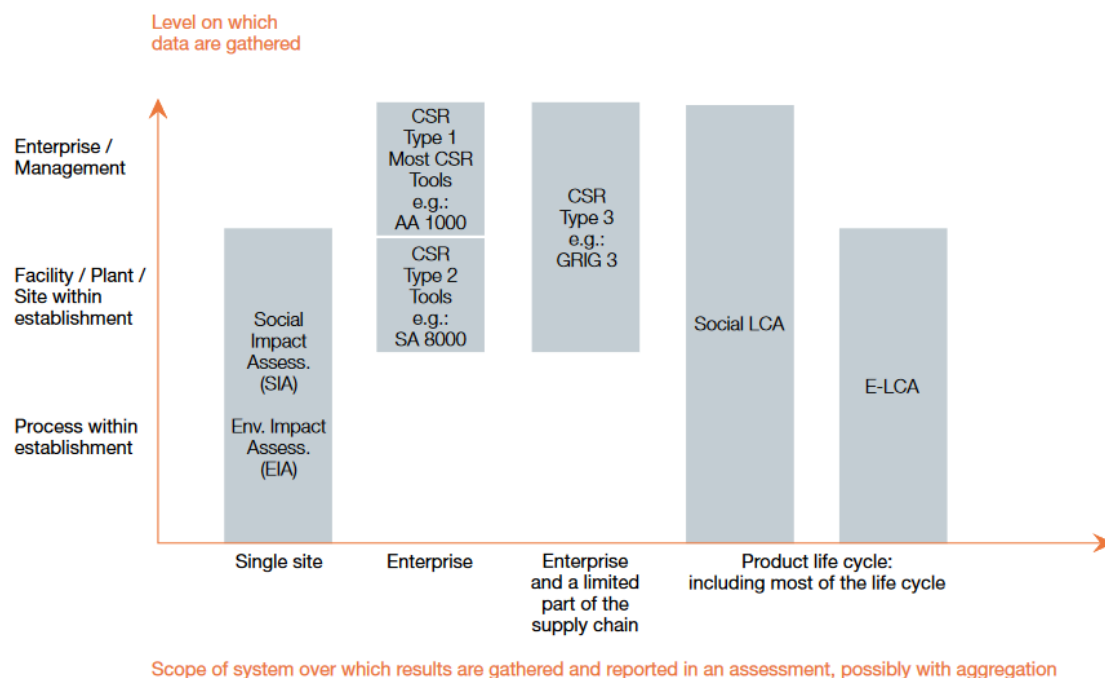


Figure 7: Scope of CSR and impact assessment techniques of Enterprises and their product (Benoît and Mazijn 2009, 41)

While S-LCA and E-LCA follow both the life cycle thinking approach, there are some differences between the two tools, including regarding the level on which data are gathered (other differences will be detailed in the next subsection 3.2). While in E-LCA, data gathering takes place at process or facility level, S-LCA indicators can potentially regard **various levels, from process to enterprise** (cf. ordinate of Figure 7). This is because “impacts on people are naturally related to the conduct of the companies engaged in the life cycle rather than to the individual industrial processes as is the case in Environmental LCA. Inventory analysis is therefore focused on the conduct of the companies engaged in the life cycle” (Dreyer, Hauschild, and Schierbeck 2005, 88).

### **3.1.2 A tool between disciplines and epistemological paradigms**

S-LCA descends from E-LCA, a tool developed by engineers and whose focus are environmental impacts, which in turn “belong to the realm of natural sciences” (Iofrida et al. 2018, 466). For its part, S-LCA assesses social impacts, which are objects of study of human and social sciences disciplines, and has been from the beginning developed by engineers mainly (Sakellariou 2016; Iofrida et al. 2018).

This difference in dedicated and used disciplines carries implications for the epistemological paradigm that is adopted by researchers, that determines itself the “research questions and hypotheses, methods for data gathering and analysis, ways of presenting research insights, and broader issues about causality and generalizability (Phoenix et al. 2013 cited by Iofrida et al. 2018, 466). In natural sciences, “positivism-oriented paradigms dominate [...] (Tacconi 1998)”: accordingly, “it exists only one objective reality, apprehendable, patterned, and predictable” (Iofrida et al. 2018, 470). Corresponding methodologies are “experimental, deductive, nomothetic, purely quantitative”, and cause-effect chains can be verified (Ibid). In social sciences, there is not one dominant paradigm but an epistemological eclecticism: with scientific and disciplinary roots in management and sociology, S-LCA researchers would adopt a post-positivist<sup>24</sup> paradigm for a minority, while most of them would adopt an interpretivism-oriented paradigm. According to the latter, “the real essence of the reality cannot be known. Reality is constructed and interpreted through perceptions”, and methods used are “hermeneutical, dialectical, [and] mainly qualitative (Iofrida et al. 2018, 470).

Given this positioning of S-LCA at the crossroads of disciplines and epistemological paradigms, we can understand better the difficulties met by S-LCA researchers to develop the tool.

## **3.2 Methodological challenges relating to S-LCA**

While it would be desirable that S-LCA, as a complementary tool, brings equivalent benefits as E-LCA, primary focuses of both tools are different. Because of those differences, there are major methodological challenges to configure and implement S-LCA, which require research work. Those methodological challenges are about two main issues: i) what should be assessed and ii) how to assess impacts in S-LCA.

### **3.2.1 What should S-LCA assess?**

**What would be the equivalent to physical flows?** E-LCA assesses impacts from physical inputs required by product life cycles, with the use of known impact pathways linking those inputs and emissions to environmental problems. One of the first tasks in E-LCA is then to list those inputs. In S-LCA, however,

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<sup>24</sup> Post-positivism deviates slightly from positivism and acknowledges that “the fully explanation of reality is impossible”, but that “replicated findings are probably true” (Iofrida et al. 2018, 470).

“there is nothing equivalent to physical inputs” and it is not possible “to make out a comprehensive inventory of all immaterial phenomena generating social effects” (Macombe 2013c, 143).

At best and to match E-LCA methodology, the assessment could be started from the input which is excluded from the environmental assessment: labor. Its quantity can be measured easily, however, there are several reasons why it is *a priori* not satisfactory. First, if labor input is the only inventory indicator considered, this would leave the consumption stage (and all other stages not using labor) outside of the assessment. Secondly, there are many other relevant aspects regarding other stakeholders (final consumers, local community), but also regarding labor, such as qualitative aspects (e.g. whether workers are fairly paid, whether the employment arrangement provides social benefits and security to workers, cf. 1.2). While it remains to be seen which ones of those aspects should be included in the assessment, their assessment cannot obviously be derived from the quantity of the ‘social input’ which is labor, as done in E-LCA (meaning that there is no causal relationship between job quantity and job quality) (3<sup>rd</sup> reason). Thus this indicator alone cannot be used to derive social impacts.

Thus, the framework of E-LCA, deriving impacts from inputs, cannot be used for S-LCA: a first challenge in S-LCA is thus to define what should be assessed, and how assessment criteria are to be articulated.

**The 31 subcategories of the UNEP/SETAC Guidelines.** A first reply has been brought by the UNEP/SETAC Guidelines, with a list of 31 ‘subcategories’, built by a team of S-LCA researchers, including on the basis of a consultation process at international level involving a broad range of stakeholders (cf. Figure 8). However, this list is criticized and there is no consensus thereupon.

Stakeholder categories	Subcategories
<b>Stakeholder “worker”</b>	Freedom of Association and Collective Bargaining Child Labour Fair Salary Working Hours Forced Labour Equal opportunities/Discrimination Health and Safety Social Benefits/Social Security
<b>Stakeholder “consumer”</b>	Health & Safety Feedback Mechanism Consumer Privacy Transparency End of life responsibility
<b>Stakeholder “local community”</b>	Access to material resources Access to immaterial resources Delocalization and Migration Cultural Heritage Safe & healthy living conditions Respect of indigenous rights Community engagement Local employment Secure living conditions
<b>Stakeholder “society”</b>	Public commitments to sustainability issues Contribution to economic development Prevention & mitigation of armed conflicts Technology development Corruption
<b>Value chain actors* not including consumers</b>	Fair competition Promoting social responsibility Supplier relationships Respect of intellectual property rights

Figure 8: Stakeholder and sub- categories in the UNEP/SETAC Guidelines (Benoît and Mazijn 2009)

*Social impacts?* One major critic is that these subcategories do not correspond to social *impacts* per se, which are impacts always experienced by (a group of) people (Macombe 2013c). However, this distinction with social impacts was already recognized in the UNEP/SETAC Guidelines, which clarify that these subcategories are “socially significant *themes or attributes*” (Benoît and Mazijn 2009, 43) rather than social *impacts*, and that S-LCA “aims to assess the social and socio-economic *aspects* of products and their potential positive and negative impacts” (Benoît and Mazijn 2009, 37).

*Ideological?* Also, many of the subcategories<sup>25</sup> would be “highly ideological and may be interpreted differently depending on political and ethical views and on cultural background”. Yet, S-LCA indicators would “need to be unambiguously interpreted and meaningful in all social contexts along the life cycle”, such as health impacts derived from the exposure to certain substances with the DALY indicator (or disability-adjusted life years), coming from E-LCA (cf. Chapter 2) (Baumann et al. 2013, 518). According to those authors, “health is the most intrinsic social value of all and should therefore be in focus in S-LCA”, rather than subcategories of the Guidelines (Baumann et al. 2013, 525).

*Subcategories included by principle versus scientifically-valid subcategories?* Going a bit further than the above-described critic, it has been argued that it is uncertain whether there is a positive causal relationship between the respect of the principles contained in some of the subcategories (e.g. child labor but also working hours, property rights) and a positive impact on well-being, thereby questioning the general relevance of such a list (Arvidsson et al. 2014; Jørgensen et al. 2009; Macombe 2013). The most discussed issue is the subcategory of child labour, as argued by (Jørgensen, Lai, and Hauschild 2009, 14): “the mere fact that a child works does not support an accurate prediction of the actual damage (or benefits) to the AoP” (well-being), because child labour can result in various negative and positive impacts (health, schooling, low-wages, increase in autonomy, learning of skills) that can occur depending on the industry, on the number of hours worked, on the type of job. Another argument that put forward is that if a company stops hiring child labour, it is unlikely that the wellbeing of previously hired children will improve, including because of the loss in income.

Various conclusions are drawn on this issue: (Macombe and Falque 2013) argue that this link between performances of companies (in terms of use of child labour for exemple) and well-being should be proved. (Jørgensen, Lai, and Hauschild 2009) propose to assess the issue further down the impact pathway (e.g. assessing the impact of child labor on health risks, on schooling instead of incidence of child labour) or to use a more precise subcategory (hours of child labour). Finally (Arvidsson, Baumann, and Hildenbrand 2014) question the use of such subcategories in S-LCA since those are not “completely scientifically justified”. (Jørgensen, Lai, and Hauschild 2009, 13) explains this discussion as resulting from the difficult positioning of S-LCA, between policy and science:

*Considering the high sensitivity of the social area in general, this dilemma between political reality on one side and science on the other creates a difficult milieu for performing assessments. On one hand, it has to relate to issues considered as important in the political debate, but on the other hand, the scientific and theoretical foundation for the assessment, in this case the empirically supported impact pathways, has to be acknowledged. In some cases, these two aims may be difficult to combine.”*  
(Jørgensen, Lai, and Hauschild 2009, 13)

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<sup>25</sup> e.g. child labour, working hours, the presence of labor unions, policies to protect cultural heritage, freedom of expression, a locally hired workforce, and intellectual property rights

If researchers assess scientifically-justified criteria and indicators only, we may ask on the other hand if “the selection [of indicators] is guided more by what can be measured (technically) than by what should be measured (normatively; Salvado et al., 2015) (Kühnen and Hahn 2018). This debate also highlights the reluctance of some researchers to include normativity, values and beliefs in S-LCA, and to get closer to a tool based on a “deontological ethics instead of a consequential ethics normally connected to the LCA methodologies” (Jørgensen, Lai, and Hauschild 2009, 14).

*An analytical tool?* A last critic raised against assessments performed with the list of subcategories of the Guidelines is its lack of analytical power. This list of subcategories has been put forward because of the difficulty to assess potential social impacts (cf. 3.2.2). However, the choice of indicators of such a list, inspired by CSR initiatives (cf. CSR and S-LCA), would be mainly “empirical and arbitrary, those are “listes à la Prévert”, non-homogeneous and unlike according to the various approaches” (Feschet 2014, 163). It would lack a proper conceptual and theoretical basis that would make the tool able to bring explanations and/or to help anticipate potential impacts, in short being analytical rather than descriptive. Indeed, a list of this kind lacks “indications regarding causal relationships, links with sustainability and/or hierarchy between the various used indicators” (Stiglitz et al. 2009, 69) cited by (Feschet 2014, 182) (Feschet 2014; Iofrida et al. 2016). 3.2.2 How to assess potential social impacts or how to include impact pathways in S-LCA?

**An open field for future research.** The above-discussion brings us to a second main challenge, that is the assessment of potential social impacts of product life cycles, as done in E-LCA in the Life cycle impact assessment phase (LCIA). What is generally expected is the assessment of potential social impacts, i.e. impacts experienced by stakeholders, to be derived from practices of life cycle organizations (e.g. regarding labor) or from (a change in) the functioning of the product life cycle. According to the Guidelines, LCIA methodologies “are under development and are an open field for future research” (Benoît and Mazijn 2009, 84).

**Assessing impacts from subcategories?** While acknowledging this, the Guidelines propose that, from the configured list of subcategories (Figure 8), impacts should be derived on e.g. human wellbeing level, specifying at the same time that “more experience needs to be gained in order to determine one, or several, final sets of generally accepted impact categories” (Benoît and Mazijn 2009, 70). The only fixed proposal of the Guidelines is thus to assess potential impacts *from the subcategories*. Yet, as alluded to earlier (cf. 3.1.1), their use has been precisely criticized for not having demonstrated a scientifically-founded relation with individual’s well-being (Arvidsson et al. 2014; Macombe 2013). Even if this major critic is overlooked, only a few researches assessing potential impacts have been carried out.

**A majority of ‘reporting/type I S-LCA’.** Consequently, most S-LCA studies bypass the problem by assessing social performances of life cycle organizations, with the use of e.g. subcategories of the Guidelines. This means that impact pathways (or cause-effect chains) linking two phenomena (or inputs and environmental problems in E-LCA) are not used in the assessment. In those studies (called of ‘type I’), company’s practices are measured (e.g. wages), compared to standards or Performance reference points (e.g. minimum wage in a given country), and a score is given according to the respect of the standard<sup>26</sup>. Those studies actually *report* on social issues, just as done in CSR/sustainability reports (Feschet 2014).

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<sup>26</sup> Other reference points than standards can be used, such as e.g. industry average (Russo Garrido et al. 2016b)

**Potential reasons behind the difficulty met by researchers to assess potential impacts.** One reason put forward is that cause-effect chains for social and socio-economic aspects have been **less investigated** than economic or environmental ones (Benoît and Mazijn 2009, 84; Macombe and Falque 2013). It might be also that the difficulty is rather linked to **the background of S-LCA researchers** than to the state of research in social sciences: the background in natural sciences they have for most of them makes it more difficult to cope with social topics, generally addressed with social sciences methods (Macombe and Falque 2013). Another reason put forward lies at an **epistemological level**, with researchers conducting Type I/reporting S-LCA adopting an interpretivist approach (rather than post-positivist approach used in Type II studies), whereby “reality cannot be explained but can be understood and described” (Iofrida et al. 2016, 470). Also, the differing nature of the focuses of both tools (social impacts versus environmental impacts) is pointed out as reason for this challenge. According to (Arvidsson et al. 2014, 171), “social topics are typically **less clear-cut** than environmental issues when it comes to determining what is a positive and what is a negative impact”, with values and context coming into play.

A difficulty comes from the **nature of indicators** used in S-LCA. First, when looking at subcategories, one can see that most of them are **qualitative**. While these are generally processed into semi-quantitative indicators, this makes calculations such as the ones made in E-LCA not possible. Secondly, while in E-LCA collected data are proportionate to the functional unit (and an assumption of linearity is made), many indicators used traditionally in S-LCA are not and thus these are **either additive**, i.e. their value cannot be added along the product life cycle. An additive indicator would be for example the quantity of labour required by a product life cycle. A non-additive indicator would be the fairness of wages, which will not evolve according to the functional unit (although it is based on a quantitative information). This will also apply to all semi-quantitative indicators based on qualitative information. This means that most indicators cannot be aggregated (within life cycle stages) and comparison of life cycle stages in terms of their relative impact can be hardly done. In addition, extrapolation is not possible.

To contribute to addressing those methodological challenges was from the beginning the objective of the PhD, as explained in the next sub-section.

### ***3.3 Aim of the PhD, research questions and work plan***

#### **3.3.1 Objectives, research questions and basic assumptions**

In this PhD, we aim to address both issues discussed above: i) what should be assessed in S-LCA and ii) how to assess potential social impacts or to include impact pathways in LCIA; what brings us to a third related question: iii) how should the assessment be carried out, so that it goes beyond a mere reporting?

**More precisely, we investigate first** what could be relevant assessment criteria for S-LCA and how those can be articulated so that S-LCA can help improve effectively the social sustainability of products. Particularly, we will discuss whether only approaches justifying scientifically the choice of assessment criteria are valid or whether such a normative list as the one of the Guidelines can be relevant and legitimate to assess the social sustainability of products. Those questions lead actually to broader questions such as the content of social sustainability (what is it?) and the way that this content should be defined (how to define social sustainability? Who should define it?). It also leads to questioning the sustainable development/sustainability approach adopted by S-LCA researchers.

In order to determine what should be assessed, we assume on one hand the relevance of the normative character of the list of the Guidelines to assess the social sustainability of products, especially if it comes from a consensus established following a broad consultation which could be of relevance to every

human being. However, we also recognize the shortcomings of the list, which could be improved. In order to feed such a process, we propose to investigate the use of a more localized participation process to make the list more adapted to the context of analysis.

**Secondly**, we investigate how S-LCA could become an analytical tool, rather than a descriptive/reporting tool. Thus, we recognize on the other hand the need of an analytical tool including causes and effects of phenomena in product chains. In this regard, we propose to investigate the use of a specific theoretical framework as a way to articulate assessment criteria and indicators. **Concretely**, we analyze first what has been proposed as S-LCA frameworks and methods to assess social impacts. In parallel, we analyze the critics raised over those existing S-LCA frameworks, including the UNEP/SETAC Guidelines (ideological, non-scientifically valid subcategories, mere reporting and non-analytical tool, lack a proper conceptual and theoretical approach) and methods. Our main objective is to potentially address those with specific methodological proposals. Those issues will be investigated with the support of case studies assessing products from alternative food networks (AFNs) in Belgium, as application fields.

### 3.3.2 General architecture of the PhD

The general architecture of the PhD is composed of three main parts (cf. Figure 9). First, a state of the art of S-LCA studies is conducted on various aspects of S-LCA (1<sup>st</sup> part). From this state of the art, a number of conclusions on S-LCA practice and developments are drawn as well as methodological proposals and a specific S-LCA framework (2<sup>nd</sup> part). These methodological proposals and S-LCA framework are applied on two case study on food products (3<sup>rd</sup> part).

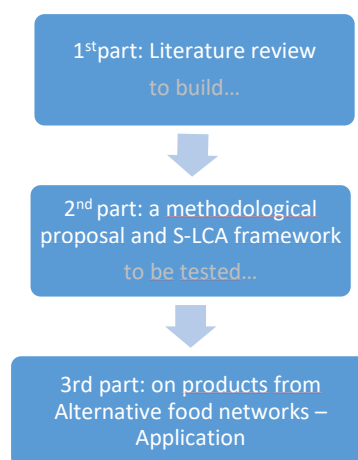


Figure 9: Structure of the PhD manuscript

**Our state of the art (1st part)** is composed of three distinct parts, from which we draw key conclusions regarding SLCA practice: first we look at existing S-LCA frameworks (e.g. the UNEP/SETAC Guidelines) and at what is assessed in S-LCA (i.e. criteria and indicators), second we look at type II S-LCA and how impacts are assessed in those S-LCA studies, and third we look at existing applications in the food sector and at the results and empirical learnings that are drawn from existing S-LCA studies.

**The second part** details our methodological proposals and the building of the S-LCA framework that we propose. Those are applied in **the third part** to two different case studies and compared to applications of two other existing S-LCA frameworks (the UNEP/SETAC Guidelines and the Capacities Multiple Capital model S-LCA). Our first case study has been carried out within a co-creation research project called COSY-Food involving three alternative food networks: a Community-supported agriculture network, a

webshop selling local products within a short food chain, an organic shop selling products traded “conventionally” and developing the selling of local products from short food chains (bought directly to producers, not passing through a wholesaler). The second is the assessment of a North/North Fair trade Belgian initiative and focuses on one life cycle stage, the primary production of milk. From those applications we expect two main results: a comparison with other S-LCA frameworks and a comparison between food chains differing in terms of governance. With this latter comparison we will test AFN claims about their assumed benefits (e.g. better income for farmers, access to healthy and affordable food, etc. (Forssell and Lankoski 2014) and identify improvement levers.

### 3.3.3 Rationale for the PhD’s methodological approach and sequencing

In order to address our research questions, we chose to follow this particular **three-step approach**, composed of i) reviewing literature; ii) on this basis, proposing methodological developments; and iii) applying those, as a test of their relevance and applicability (cf. Figure 9). Given the general and rather practical objective of the PhD which was in the beginning to contribute to the methodological development of a tool to assess the social and socioeconomic impacts of product life cycles, this approach seems relevant.

The **review exercise** should allow us to get a broad and deep understanding of the issues relating to S-LCA development and practice, which appear complex at first sight. S-LCA is meant to complement E-LCA, and to comply to the life cycle thinking approach. It is thus important to understand what this compliance implies for the methodological development of S-LCA. Also, S-LCA has been primarily developed by researchers mainly from the engineering field on the model of E-LCA but also from other disciplines. This gave rise not to a homogeneous set of methodological developments in S-LCA, but to various and rather heterogeneous developments, that have themselves been criticized. Entering the field requires understanding fully the concepts and methods used by researchers from other disciplines, and the critics raised towards those, in order to be able to identify shortcomings and relevant proposals.

With this PhD, we hope to contribute to the methodological development of S-LCA by bringing **concrete propositions** addressing the two main issues detailed above.

Those propositions, drawn partly from the state of the art exercise, will be consolidated through the **application** part, which will be used to draw empirical learnings on the specific assessed cases, but also to test the relevance and applicability of the methodological propositions.

While this 3-step approach can appear linear, it included iterations, and there were some overlaps between the three steps. More particularly, one of the proposal<sup>27</sup>, has been applied and tested from the second year of the PhD and contributed to the building of further methodological proposals, together with the review exercise.

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<sup>27</sup> I.e. the building of the S-LCA framework with a participatory approach, cf. Chapter 4, 1.2.



# 1<sup>ST</sup> PART: STATE OF THE ART

In this first part, we review S-LCA frameworks and practice up to 2018. This review is declined in three chapters.

**In the first chapter**, we investigate the issue of *what should be assessed* and we conduct a review of existing 14 S-LCA frameworks in order to understand i) the origin, selection and applicability of S-LCA assessment C&I, ii) the purpose of the assessment, and the assessed phenomena as reflected in the indicators, and iii) the scope of C&I of the topics, life-cycle stages and stakeholders.

**In the second chapter**, we investigate the issue of *how social impacts should be assessed and how to include impact pathways in the analysis* and we conduct a review of studies classified as type II S-LCA, i.e. those seeking to assess potential social impacts or to integrate impact pathways in the assessment. We analyze the main characteristics of each studies, i.e. their main purpose, the method used, the issues covered and the origin of data.

**A third, shorter chapter**, focuses on existing SLCA case studies in the food sector and looks at the results of those studies, and at the empirical learnings made through those studies.



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## CHAPTER 1: What is assessed in S-LCA? A review of frameworks proposed to assess social aspects or impacts of product life cycles

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Adapted from Sureau, Solène, Bernard Mazijn, Sara Russo Garrido, and Wouter M. J. Achten. 2018. "Social Life-Cycle Assessment Frameworks: A Review of Criteria and Indicators Proposed to Assess Social and Socioeconomic Impacts." *The International Journal of Life Cycle Assessment* 23 (4): 904–20. <https://doi.org/10.1007/s11367-017-1336-5>.

### 1. Introduction

#### 1.1 Context and definitions

S-LCA is not a consolidated method and faces several methodological challenges despite the significant steps that have been taken, including the availability of Guidelines for S-LCA (Benoît and Mazijn 2009).

The Guidelines for S-LCA provide recommendations on how to conduct the first two phases of S-LCA (i.e., goal and scope definition and LCI). The research on the third phase (LCIA) was, at that time, not considered sufficiently mature to be included in the Guidelines. The Guidelines propose subcategories, which can be considered as assessment criteria, i.e., "distinguishing element[s] which a thing is judged by" (Namkoong et al. 2002) and which qualify what is aimed for, e.g., assessment of sustainable development or human well-being. A separate publication (Benoît et al. 2013) proposes indicators, which (Prabhu et al. 1999) define as "any variable [...] used to infer the status of a particular [assessment] criterion". While the Guidelines are an important reference methodological framework<sup>28</sup> for S-LCA, they currently co-exist with a plethora of other S-LCA methodological frameworks and methods (R. Wu, Yang, and Chen 2014) proposing alternative criteria and indicators (C&I).

#### 1.2 General aim

As part of evolving to an agreement over how S-LCA should be conducted, there is a need to identify and understand characteristics and differences of what is assessed among S-LCA methodological frameworks which have been developed in the 2005-2016 period. Recent reviews (Parent et al. 2010; Chhipi-Shrestha et al. 2014; Wu et al. 2014; Russo Garrido et al. 2016) have focused on differences among S-LCA frameworks in the LCIA phase and on the question of how to measure S&SE impacts. A more recent review (Iofrida et al. 2016) classifies S-LCA approaches according to the research paradigm applied, chiefly on the basis of the LCIA methodology. Whereas the latter was not explicit, various criteria have been used, from the involvement of the researcher and of stakeholders, to the choice of impact categories and of inventory data. This review comes up with three groups of paradigms: postpositivist-oriented (considering impact pathways and corresponding to E-LCA paradigm), interpretivism-oriented, and studies following both paradigms.

In the same vein, our research seeks to make a classification of S-LCA approaches and to provide justifications for differences. However, in this review, our perspective is different since our main parameter is not the LCIA methodology, but the definition and selection of what is being measured in different S-LCA frameworks (i.e., the rationale behind C&I lists). More specifically, we focus on where the lists of C&I put forward by different frameworks are derived from (e.g., CSR criteria, UN conventions,

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<sup>28</sup> By S-LCA framework we mean a methodological framework characterized by a certain vision on the method, containing general principles to conduct S-LCA, including a list of C&I (e.g. the S-LCA Guidelines) or specifications on what C&I should reflect or a way to select them (e.g., S-LCA participatory approach of (Mathe 2014). It is designed to provide a structure that can be systematically applied to other case studies (Haaster et al. 2016).

people's values), and how the selection of C&I is made (i.e., selection method, e.g. by the authors themselves, by experts, by stakeholders). We believe reflecting on these methodological aspects is fundamental as the method to define and select C&I can have as profound implications on a study scope and results as the LCIA method used. Lastly, grappling with the question of what C&I to select for SLCA is an all too common and recurring question for which few, if any, comprehensive and analytical approaches have been proposed to enlighten SLCA practitioners' decision making.

In addition to i) the underlying rationale behind the selection of the C&I, we focus on two other related characteristics: ii) what observed phenomena are being assessed (e.g., company practices, social impacts, and their position on the impact pathway), and iii) the topics, stakeholders and life-cycle stages that they cover.

We propose a typology of S-LCA frameworks through which we seek to reduce the complexity of the booming S-LCA research field by looking for convergences and divergences between frameworks. On the basis of this review, we further seek to identify and develop research perspectives and recommendations for S-LCA. In the next section, we specify the materials that have been used to conduct the review. We then detail the rationale for focusing on the three issues listed above, as well as the methods implemented. We explain our results in a third section, before presenting some perspectives and conclusions.

## **2. Materials and methods**

### ***2.1 Materials***

We started our literature review on S-LCA frameworks from various existing literature reviews on S-LCA (Jørgensen et al. 2007; Parent, Cucuzzella, and Revéret 2010; R. Wu, Yang, and Chen 2014; Chhipi-Shrestha, Hewage, and Sadiq 2014; Mattioda et al. 2015; Delcour et al. 2015; Russo Garrido et al. 2016a; Fan et al. 2015; Petti, Serreli, and Cesare 2016; Macombe et al. 2013; Iofrida et al. 2016; Arcese et al. 2016). We further identified additional publications by bibliographic searches with our internal institutional search engine (CIBLE+, ULB, Belgium) and conventional international engines Scopus and Google Scholar. We also looked into conference proceedings and websites of consultancy companies. These searches resulted in peer-reviewed (conference) articles, book chapters, research reports and PhD theses.

Of all the papers found through these searches, a number were selected for further review if 1) the outcome was described as guidelines, guide, handbook, tool, instrument or framework for S-LCA; or 2) they defined general principles for conducting S-LCA; 3) they proposed a list of criteria, indicators or impact categories for evaluating impacts of products/industries in S-LCA; and 4) they proposed a method for selecting C&I that is different from existing frameworks and can be applied to other case studies.

The following studies were excluded from further analysis: studies applying/adapting an existing framework (e.g., studies applying the Guidelines); studies proposing C&I specifically for one product/industry; studies proposing a list of C&I that did not specify or detail the origin and/or the way of selecting the C&I; studies assessing a single indicator; studies focusing on another methodological development (e.g., LCIA, setting of the system boundary).

The next section explains the rationale for focusing on the three selected review objectives/issues and the review method implemented.

## 2.2 Rationale, state of the art and methods

### 2.2.1 The rationale behind the selection of assessment criteria and indicators

The set of criteria pre-defined by a methodological framework influences the social issues covered by a study that applies the framework – it determines the topics that will be looked at in the study. Choosing a certain methodological framework, that includes certain criteria (and not others), thus has implications.

The selection of assessment criteria is a subject of debate in the research field of social impact assessment and sustainability indicators (Hák, Moldan, and Dahl 2012; Bell and Morse 2001; Mccool and Stankey 2004; Vanclay 2002). While the issue of the origin and selection of assessment C&I seems to have arisen less prominently in S-LCA in recent years, the issue seems to be inherently part of some ongoing discussions (e.g., area of protection [AoP] for S-LCA, assessment of impacts) and has been raised as an element determining the paradigm taken by S-LCA studies (Iofrida et al. 2016).

For S-LCA, there is yet a common list of S&SE impacts agreed, in the sense that proposed lists are still debated. One agreed constraint is that potential S&SE impacts must be assessed (Benoît and Mazijn 2009), with a view to contributing ultimately to human well-being. The latter has indeed been defined by researchers as the AoP for S-LCA (Reitinger et al. 2011), even while it remains undefined and imprecise (Feschet 2014). Most studies mention the link with sustainable development without clarifying or describing the approaches considered for this vague concept (Feschet 2014, 159).

There have been efforts to establish a list of C&I to guide the data collection: the Guidelines propose a list of 31 subcategories, defined as “*S&SE issues of concerns and relevant characteristic or attribute to be assessed*” (Benoît and Mazijn 2009, 71). One aim behind this list is “*to prevent using S-LCA results on a few limited topics for social marketing aims while not addressing core issues*” (Benoît and Mazijn 2009, 71).

Although it has been broadly used since 2009 (Wu et al. 2014; Chhipi-Shrestha et al. 2014), this list of subcategories has been criticized by some researchers, e.g., because there is not always a linear and straightforward causal relationship (or impact pathway) between subcategories and sustainable development (Arvidsson, Baumann, and Hildenbrand 2014; Jørgensen, Lai, and Hauschild 2009). This is why some authors investigate impact pathways that link product processes with social impacts that are to be included in S-LCA (Macombe 2013b; Feschet et al. 2012; Bocoum et al. 2015).

There have also been calls to make the adopted conceptual model underlying an S-LCA method more explicit, and to use theoretical models as a basis (Feschet 2014). While a conceptual model defines concepts, a theoretical model helps to clarify “the sense given to concepts”, and seeks to explain phenomena (Feschet 2014, 157). Yet, the Guidelines would be based on CSR, a rather static and descriptive approach which does not offer an understanding of the implications of companies’ practices (Feschet 2014). A theoretical model is argued to help identify what is important to assess and would bring stability to the criteria and indicators used among studies regardless of different geographical and time contexts as well as study sponsors or data availability (Feschet 2014; Macombe 2013a), thus enhancing comparability of studies. In addition, it would help to propose a coherent set of C&I, instead of individually unrelated C&I.

Meanwhile, other methodological S-LCA frameworks have been put forward, such as private-sector-driven frameworks (e.g., Product Social Metrics), with other lists of assessment C&I. Some authors propose contextualized lists of C&I (Mathe 2014), arguing that social indicators are context-dependent.

These discussions, developments and propositions call for a close examination of how assessment C&I should be selected within S-LCA and on what basis (i.e., the rationale behind their selection), and what the existing frameworks propose in this regard.

**Method.** For each framework we identified the different rationales behind the selection of C&I in these frameworks, i.e., the origin of the C&I proposed (e.g., UN conventions) and the ways in which these were selected (e.g., expert consultation). Answering these two questions will help us understand why certain frameworks propose certain criteria. We also looked at whether the list of C&I was meant to be applicable in any context or if it was meant to be adapted according to the specific sector under study or to the local context (as specified by authors of frameworks). On this basis, we propose a classification of frameworks with regard to the origin of C&I and their selection. Following this review, we describe each framework.

The origin of C&I and the ways that C&I are selected result in different lists of C&I, which potentially reflect different phenomena.

### 2.2.2 The purpose of the assessment and the assessed phenomena

S-LCA should assess impacts. However, given the complexity of assessing S&SE impacts (Slootweg et al. 2001), this objective is nuanced in the Guidelines, which define S-LCA as “a social impact (and potential impact) assessment technique that aims to assess the S&SE aspects of products and their potential positive and negative impacts along their life cycle” (Benoît and Mazijn 2009, 37). Assessment C&I proposed can then reflect both aspects such as practices (e.g., level of paid wages), or impacts (e.g., health impacts of working conditions). There are two trends in S-LCA LCIA practice: Type I S-LCA, which assesses performances and Type II S-LCA, which assesses impact pathways between two variables or directly impacts (Parent, Cucuzzella, and Revéret 2010; R. Wu, Yang, and Chen 2014; Chhipi-Shrestha, Hewage, and Sadiq 2014), with performances upstream of the impact pathway, and impacts downstream. However, in some Type I studies, some performances could be located further down the impact pathway (Russo Garrido et al. 2016a), blurring the distinction between Type I and II.

**Method.** With this in mind, various frameworks will be reviewed, focusing on the position of the proposed C&I on the impact pathway. For this task, we use the same classification as (Russo Garrido et al. 2016a), distinguishing three positions on the impact pathway (cf. Figure 10): activity on the product system, effects or impacts. A social effect is “a social phenomenon caused by [a] change that could have impacts”, while an impact is a “consequence of [a] change that is felt by people directly in life” (Macombe et al. 2013, 206). Some studies also use context data in S-LCA “as contextual information providing insight on potential effects of corporate social performance, as a proxy for a phenomenon occurring within the product system and/or its resulting causality chains, or as an element that may affect/condition activities at the company level” (Russo Garrido et al. 2016a, 6). We will thus evaluate if a certain criterion or indicator acts on or describes a context and other stressors, an activity, an effect or an impact. Relating to the assessed phenomena, the purpose of the study as described by authors seems of interest and therefore will be assessed and reported for each framework.

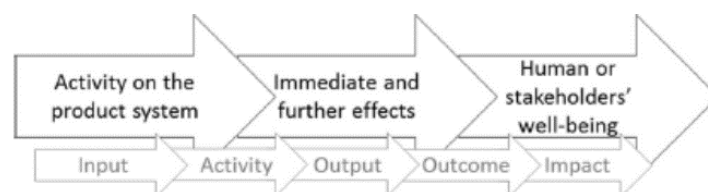


Figure 10: Positioning of indicators on the impact pathways (Russo Garrido et al. 2016)

In addition to the rationale behind the selection of C&I (section 2.2.1), the identification of the purpose of the assessment and of the assessed phenomena will enable a more comprehensive picture of S-LCA frameworks. This understanding will be completed with the implications these factors can have for topic, life-cycle and stakeholder coverage.

### 2.2.3 The topic, life-cycle and stakeholder scope of C&I

As a method based on life-cycle thinking and intended to provide a systemic and holistic assessment of S&SE impacts (Benoît and Mazijn 2009), the S-LCA set of C&I should be able to assess performances or impacts of all life-cycle stages (ideally from cradle to grave). Since S-LCA, together with E-LCA and LCC, is intended to provide a full sustainability assessment (Valdivia et al. 2011), the issue of topic coverage is essential. This is necessary for identifying potential impact transfers between life-cycle stages and stakeholders, and between assessment criteria, when comparing different product life cycles.

**Method.** In order to address this issue, we examine the lists of C&I proposed in each framework and we compare them with an improved classification by stakeholder based on the one from the Guidelines. We use the Guidelines as our reference since they have been built by a range of researchers and are meant to evolve within the Social LC Alliance (Mazijn n.d.). In this way, we will be able to identify differences among C&I lists of the frameworks.

From this, we examine the life-cycle stages to which the C&I are referring (e.g., working conditions: production phase) and we consider whether the whole life cycle can be covered by the framework.

From these three perspectives, common features and differences among frameworks will be highlighted, as well as gaps regarding the life-cycle thinking approach and S-LCA initial objectives.

## 3. Results and discussion

Fourteen frameworks were identified for further review and analysis (see Table 3).

*Table 3: Selected frameworks for review*

Name of the framework/author(s) (in chronological order of publication)
Dreyer et al. (2005)
Labuschagne et al. (2005)
Kruse et al. (2008)
Guidelines for S-LCA (Benoît and Mazijn 2009; Benoît et al. 2013)
Alkire capabilities S-LCA (Reitingering et al. 2011)
Social Hotspot Database (SHDB) (Benoit-Norris et al. 2012) <sup>1</sup>
AgBalance/SeeBalance (Schoeneboom et al. 2012)
Multiple Capital Model (MCM) Capacities S-LCA (Garraabé and Feschet 2013)
PROSUITE (Gaasbeek and Meijer 2013) <sup>2</sup>
Impact pathways (Macombe 2013c)
Product Social Metrics (PSM) (Fontes 2014)
S-LCA participatory approach (Mathe 2014)
Nussbaum capabilities S-LCA (Wangel 2014)
Product Social Impact Life Cycle Assessment database (PSILCA) (Ciroth and Eisfeldt 2016) <sup>1</sup>

<sup>1</sup> The SHDB and PSILCA are databases and not frameworks. However, despite the fact that they are based on the Guidelines, they propose different C&I. In addition, databases are used by practitioners as tools for conducting S-LCA, so we decided to include SHDB and PSILCA in our review. <sup>2</sup> The framework of Weidema (2005), which proposes impact categories, is not included as such in this selection, because this framework – tested at a macro-scale with national statistics – is not directly useable at a micro scale. However, it has been used and further elaborated within the PROSUITE project, which is included in our list.

We describe each of these frameworks with its main features in relation to the three aforementioned issues.

### ***3.1 The rationale behind the C&I selection – a proposed classification of S-LCA frameworks***

The results on the origin and selection of C&I in the different frameworks are shown in Table 4. The first set of columns sets out the starting materials upon which C&I were selected. Seven types of starting materials were identified: international treaties (e.g., UN conventions); policy documents (e.g., Green Papers); voluntary standards (e.g., CSR), other assessment tools (e.g., social impact assessment), including the Guidelines, literature on well-being, on impact of economic activity/product, theoretical models, available database(s). The second set of columns sets out how the selection was made: consultation of stakeholders, from the private sector or experts. The final set of columns sets out the corresponding area of applicability (universal, sectoral, contextual).

As a first result, most of the frameworks reviewed use a combination of starting materials and ways to select C&I. Most frameworks use between two and three different types of starting materials to elaborate their list of C&I, in addition to a selection process involving experts or stakeholders. This highlights that the selection of C&I replies not to one logic but to several.

Secondly, we did not find two frameworks that used the same starting material and ways of selection (or combination of these). Based on our analysis we could group the 14 frameworks in five types (Table 4). This typology is based on the features that are brought out most strongly and on the features that distinguish each framework from the others. The first type consists of value-based frameworks that are supposed to be universal. These use international agreements and voluntary standards, but also consultations with stakeholders at an international level (Benoît and Mazijn 2009), with the main company or with the industry (Kruse et al. 2008; Dreyer, Hauschild, and Schierbeck 2005) to select C&I. A second type of framework defines assessment criteria also on the basis of values, but where these are specific to a context. Within these frameworks (Mathe 2014; Wangel 2014), assessment criteria are selected through the consultation of various stakeholders (including NGOs, consumers, local communities, etc.). A third type uses theoretical models to structure and select criteria, but uses other materials to build the lists of C&I (voluntary standards in (Garra   and Feschet 2013), other assessment tools in (Gaasbeek and Meijer 2013), Guidelines in (Reitinger et al. 2011)). A fourth type groups the impact-based frameworks, where C&I are defined by backtracking from assumed or observed effects/impacts to social stressors (Macombe 2013c). The applicability of C&I depends on the conditions for use of each impact pathway. A fifth and final type includes frameworks focusing on their applicability; half of these frameworks are based on the work done through the Guidelines. Other starting materials include standards, other assessment tools, existing databases and easily accessible information. The validation of the sets of C&I is done through consultation with experts as well as the private sector, presumably the main S-LCA users. The resulting list is generally meant to be applicable to any context.

Between applicability-oriented frameworks and the ones defining context-specific C&I, a number of frameworks propose a two-layer C&I list, universal and context-specific (Dreyer, Hauschild, and Schierbeck 2005; Kruse et al. 2008), or provide the flexibility to be adapted according to the context (Beno  t and Mazijn 2009; Garra   and Feschet 2013).

In the next section, we present the various framework types and corresponding frameworks in more detail.



Table 4: Origin, selection and applicability of assessment C&I in reviewed S-LCA frameworks

	Starting material							Selection method			Applicability		
General frameworks	International treaties/ policy documents	Voluntary standards	Literature on assessment tools including the Guidelines	Literature on well-being	Literature on impacts of products/ economic activity	Theoretical framework	Data availability	Stakeholder consultation	Private sector consultation	Expert consultation	Meant to be universal	To be adapted to sector	To be adapted to local context
<i>Universal values-based</i>													
Guidelines (Benoît and Mazijn 2009)	X	X	X					X		X <sup>1</sup>	X		X
Dreyer et al. (2005)	X								X		X	X	
Kruse et al. (2008)	X	X					X	X	X		X	X	X
<i>Contextualized values-based</i>													
S-LCA participatory approach (Mathe 2014)	X		X	X				X	X			X	X
Nussbaum capabilities S-LCA (Wangel 2014) <sup>5</sup>						X		X				X	X
<i>Theory-structured</i>													
Alkire capabilities S-LCA (Reitingen et al. 2011)				X		X					X		
MCM Capacities S-LCA (Garraabé and Feschet 2013)	X	X				X					X		X
PROSUITE (Gaasbeek and Meijer 2013)			X			X			X		X		
<i>Impact-pathway-based</i>													
Impact pathway (Macombe, 2013)					X						X		
<i>Applicability-oriented</i>													
Labuschagne et al. (2005)		X	X						X				
Ag/SeeBalance (Schoeneboom et al. 2012)	X	X	X				X	X	X <sup>2</sup>	X	X		
PSM (Fontes 2014)		X	X	X			X		X <sup>3</sup>	X	X		
SHDB (Benoît-Norris et al. 2012)				X			X		X <sup>4</sup>	X <sup>4</sup>	X		
PSILCA				X			X				X		

NB: A cross in bold means that this/these actor(s) (experts, stakeholders, private-sector) were the initiators and had the final say on the selected C&I. The corresponding actors are specified below in numbered notes. For example, for the selection of C&I of the Product Social Metrics, the UNEP/SETAC Guidelines, other standards and sources were used (OECD Guidelines, ISO) by the companies (private-sector stakeholders) that participated in the exercise. Notes: <sup>1</sup>Working/project group composed of 22 S-LCA academic and consultancy experts; <sup>2</sup>BASF company; <sup>3</sup>Company members of the Roundtable for Product Social Metrics that participated in the process; <sup>4</sup>New Earth's advisory board, composed of academic, consultancy experts and private-sector representatives. <sup>5</sup>The framework of Wangel (2014) could have been classified into theory-structured frameworks as well

### 3.1.1 Universal value-based frameworks

The Guidelines for S-LCA (Benoît and Mazijn 2009) represent one of the main references on progress regarding the definition of criteria for S-LCA. A list of 31 subcategories (or criteria) has been developed on the basis of a consultation process with a wide range of stakeholders (worker and employer trade unions, consumer and private sector associations, NGOs, UN bodies), mainly from Europe but also from other continents (Mazijn 2010) and has been peer-reviewed by CSR, LCA and sustainable development experts (Benoît and Mazijn 2009). Subcategories reflect basic UN conventions on human and workers' rights that are thought "to go beyond personal and cultural subjectivity or political orientation" (Benoît and Mazijn 2009, 48) and best practices criteria such as "international instruments, CSR initiatives, model legal framework, social impacts assessment literature". Subcategories are classified according to five types of stakeholder that can be affected by the practices of companies (workers, consumers, value chain actors, local community, society) and can be classified according to the six impact categories proposed by the Guidelines (human rights, working conditions, governance, cultural heritage, health and safety, and socioeconomic repercussions). However, the Guidelines do not specify links between subcategories and impact categories. As a follow-up, The Methodological Sheets for Subcategories in Social Life Cycle Assessment (Benoît et al. 2013) discuss the link between each subcategory and sustainable development, and propose corresponding indicators and sources.

Meanwhile, (Dreyer, Hauschild, and Schierbeck 2005) propose a two-layer S-LCA: "an obligatory, normative, predetermined set of categories expressing minimum expectations to conducting responsible business (based on UN conventions and on local and national norms), and an optional, self-determined set of categories expressing interests specific to the product manufacturer" (Dreyer, Hauschild, and Schierbeck 2005, 92). These two sets are to be related to a suggested AoP for S-LCA: "Human dignity and well-being". Similarly, (Kruse et al. 2008) propose having two sources of indicators: a first range of indicators that is "representative of broadly recognized societal values" and based "on various international conventions, agreements, and guidelines"; and a second range that is based on industry or stakeholder interests and/or data availability.

### 3.1.2 Contextualized value-oriented frameworks

Within a project focusing on the evaluation of fish farming in three different countries, (Mathe 2014) proposes a participatory approach to identify impact categories. It is justified as a way of considering the evolution of two paradigms – the viewpoint of the firm, which has seen the extension of the range of actors to be taken into account, and the evaluation viewpoint, which favors participatory approaches (Mathe 2014). The first step was to undertake "interviews with stakeholders about their representations of the social aspects of the activity concerned" (Mathe 2014, 1510). These data are analyzed to reveal lists of main principles and impacts, which are complemented through review of literature and international conventions, consolidated by S-LCA practitioners and adapted again through focus groups with stakeholders. Ultimately, the object assessed is the level of well-being induced by the ecosystem services. The present article presents a way of choosing and integrating stakeholders but does not present a list of impacts and indicators.

(Wangel 2014) proposes a framework to assess impacts of an alternative oyster value chain. The starting point is the theoretical framework defined by Nussbaum, which is a further development of Sen's capability approach and which has defined a list of 10 central universal capabilities. On the basis of these capabilities, which are constitutive of well-being, he proposes to use a participatory approach for stakeholders in the value chain to define for each capability the valuable 'functionings' (see earlier footnote) that emerge or are enhanced through the value chain.

### 3.1.3 Theory-structured frameworks

Like (Wangel 2014), other authors have taken the path of using a theoretical model to structure their proposed framework. The starting point of (Reitingier et al. 2011) is the methodological gaps identified by the Guidelines, specifically on the LCIA. They propose a theoretical framework to spell out the AoP, “namely the general concept of human well-being and the impact categories”, as a means of disclosing “our own normative assumptions” (Reitingier et al. 2011, 380). They use the frameworks of (Alkire 2002) and (Finnis, Grisez, and Boyle 1987) who defined dimensions of life, following Sen’s work, to define impact categories. According to (Reitingier et al. 2011), subcategories of the Guidelines are easy to convert into capabilities, and can be linked to the proposed impact categories.

(Gaasbeek and Meijer 2013) propose a framework to assess sustainability impacts linked to the introduction of a new technology in the process, within the broader PROSUITE project, including social impacts. This work originates in the observation that existing methodologies “do not cover all dimensions of sustainability, they do not cover them in a comparable manner, or do not include a rigorous treatment of cause-effect relations towards impacts” (Gaasbeek and Meijer 2013, 6). One objective of the approach was to use mainly quantitative indicators, in order to avoid “subjective or ad-hoc judgments as much as possible” (Gaasbeek and Meijer 2013, 6), but in the end five indicators out of eleven are actually qualitative. They use as their basis four impact categories proposed by (Weidema 2006) – autonomy; safety, security and tranquility; equal opportunity; and participation and influence – which are linked with the AoP well-being and with indicators. These indicators are defined through: literature review of social indicators; first selection with a protocol combining the normative-functional model of sustainability with the S-LCA; test against specific meta-criteria; and final selection by experts in a Delphi-group. The framework has been applied in four case studies.

(Garabé and Feschet 2013) propose a methodology based on the multiple-capital model and on Sen’s capabilities approach. With this model, « the impact of actions of companies (for each chain level, for each stakeholder category and for each capital category) on the transformation of individual endowments in additional functioning capacities” is assessed (Feschet 2014, 246). These variations in capabilities can affect the stocks of five capitals: human, technical, financial, social and institutional. An advantage of the notion of capital is thus to be able to consider flows as well as stocks, with this corresponding to a certain conception of sustainability based on stock of various capitals/resources that are to be passed on to future generations (Stiglitz 2009; Feschet 2014). Each process can be considered as an articulation of various capitals, even if not all relations between these capitals are known (Feschet 2014, 204–5). For human and social capital, authors have identified sub-classes on the basis of prescriptions of “GRI, ISO 8000 and 26000, [UN] Global Compact, OECD and EC Green papers” (Feschet 2014, 253), and sub-classes of institutional capital are based on the work of Rodrik (2000). For other capitals, the authors looked for main factors contributing to “development and thus ceteris paribus to wellbeing variations” (Feschet 2014, 253). Within these sub-classes, authors propose categories of effects.

### 3.1.4 Impact-based frameworks

This category gathers several studies (Feschet et al. 2012; Bocoum et al. 2015; Di Cesare et al. 2016) whose general approach has been described by Macombe (2013). The objective is not to assess a comprehensive range of aspects or impacts, but to develop impact pathways between an impact and the origin of this impact. In order to select assessment C&I, the proposition is to proceed in reverse, to backtrack, from effects/impacts to social stressors. As explained by Macombe, impacts caused by changes in life cycles of products have been described by scientists in the literature. Through literature

review, effects/impacts stemming from a change can be identified, as well as social stressors. The work done by researchers investigating impact pathways is then to verify and model the link between social stressors and impacts.

### 3.1.5 Applicability-oriented frameworks

The framework of (Labuschagne, Brent, and van Erck 2005) aims to assess sustainability of projects and technologies in the processing industry, but can be used for the assessment of products as well. On the basis of a literature review mainly of other assessment tools and voluntary standards, the authors built a set of social criteria classified into four categories (internal human resources, external population, macro social performance, and stakeholder participation). Managers and assessment practitioners of a large South African petrochemical company assessed the suitability of the framework and the relevance of criteria through a survey. In a further publication (Brent and Labuschagne 2006) developed a set of indicators and tested them through 10 case studies, which revealed the difficulty of applying the framework given data availability for some criteria.

The private sector has also developed other frameworks for S-LCA. The first one has been elaborated by BASF with the Universities of Karlsruhe and Jena as well as the Öko-Institut e.V., initially for all products: SeeBalance (Schmidt et al. 2004), and later specifically for agricultural products, AgBalance (Schoeneboom, Saling, and Gipmans 2012). The concept underlying the approach is socio-efficiency, which represents the social benefits throughout the entire life cycle of a product in relation to the costs for the end customer for buying, using, maintaining, and finally disposing of or reselling the product (Schmidt et al. 2004). When SeeBalance was developed, a literature review was conducted to look for social goals and indicators. The selection among this literature was made according to applicability of identified social goals for product and process assessment. Indicators were elaborated for the development of AgBalance only, through a consultation “with international stakeholders, experts and decision makers”, and BASF had the last word on the basis of “relevance, inclusiveness, practicality of quantification and availability of data sources” (Schoeneboom, Saling, and Gipmans 2012, 6).

Similarly, PRé Consultancy started in 2013 to develop a methodology through the Roundtable for Product Social Metrics, gathering multinationals such as Ahold, BASF or BMW Group, resulting in a handbook: the Products Social Metrics (Fontes 2014). While the tool is presented as one that builds on existing initiatives such as the Guidelines, and CSR corporate level standards (GRI, ISO), it is stated that these latter lack “harmonization across peer-to-peer approaches”, which the Roundtable aims to address. The definition of C&I was also supported by the review of other assessment tools (OECD, UN) and expert consultation. One of the selection criteria was the availability of data in public or private databases<sup>29</sup>.

It has to be noted that some preliminary reports have been published by the World Business Council for Sustainable Development (WBCSD) to provide guidance to measure socioeconomic impacts (WBCSD 2013) and social capital impacts (KPMG 2015), but with no reference to S-LCA or to assessment with the life-cycle approach.

On the basis of the Guidelines, two databases have been built that propose statistical data for indicators related to some of the Guideline’s subcategories. The Social Hotspot Database (SHDB, (Benoit-Norris, Cavan, and Norris 2012) has been built in order to provide practitioners with generic data to identify

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<sup>29</sup> In 2018, the Product social metrics as well as the list of C&I was updated (Goedkoop, M.J., Indrane, D., and de Beer, I.M 2018).

social hotspots in value chains, i.e., processes with high social risks, which require site-specific data to be collected. Social hotspots are identified through the determination of most important country-specific sectors (CSS) or processes in the product supply chain, based on the number of worker hours, and identification of social issues in these CSS. Twenty social issues and around 100 indicators are included in the SHDB, and were selected from the Guidelines by the advisory board of the consultancy company that developed the database (New Earth). Obviously, this choice was guided by the availability of statistical data at national and sectoral level.

The other database is the Product Social Impact Life Cycle Assessment (PSILCA) database developed by the consultancy company Greendelta. It provides statistical data for 88 qualitative and quantitative indicators under 25 subcategories from the Guidelines. For the indicators, several sources were used (Gaasbeek and Meijer 2013), (Fontes 2014), (Benoît et al. 2013) and (Ciroth and Eisfeldt 2016).

In conclusion, various methods are used to select C&I in proposed frameworks. While looking at these methods, we can better understand the different rationales behind the choice of C&I, some looking at legitimate C&I sets – whether scientifically or ethically – while others are looking for feasible C&I sets. But we can also highlight common bases among them with almost every starting material used by several frameworks, as well as interlinkages, with many of them using the Guidelines or other assessment tools as a basis. To have a deeper understanding of these frameworks, it seems of interest to look at their purpose and at the object which is effectively assessed.

### ***3.2 The purpose of the assessment and assessed phenomena***

For each framework Table 5 describes: 1) the specific purpose of the proposed framework as specified by the authors of the framework (Column A); 2) what phenomena the authors aim to assess (Column B); 3) what is being actually assessed by the framework (Column C); 4) how the articulation with impacts was carried out, in cases when this was done (Column D).

For most of the frameworks, S-LCA is meant to support decision-making, with some of them also mentioning the identification of areas for improvement, and communication (Benoît and Mazijn 2009; Fontes 2014; Schoeneboom, Saling, and Gipmans 2012) (Column A). However, the assessed phenomena, as specified by authors (Column B), vary greatly, from company practices and social aspects of products, to the level of well-being generated by an industry or the variation in capabilities of stakeholders. Finally, the PSILCA and SHDB frameworks have a completely different focus (and purpose), since their objective is to identify hotspots or processes where social risks may be present, in order to prioritize site-specific data collection.

Going from Column B to Column C, it should be noted that there are discrepancies in what is described by some authors and what indicators effectively reflect. In most cases, it is because the term “impact” is used instead of “practices”, “performances” or “effects” (Kruse et al. 2008; Benoît and Mazijn 2009; Schoeneboom, Saling, and Gipmans 2012; Fontes 2014)

As highlighted in Column D, most frameworks consider C&I separately, apart from impact-based framework which are meant to investigate relations between indicators. Some frameworks mention impact categories, but they do not detail how to relate C&I to these (Benoît and Mazijn 2009; Gaasbeek and Meijer 2013). A last group, composed of the frameworks based on the capabilities approach (Wangel 2014; Reitingner et al. 2011; Garrabé and Feschet 2013) as well as the framework of (Mathe 2014) describe a path to impacts, in a more and less detailed form.

First, it needs to be noted that for some of these frameworks (Wangel 2014; Mathe 2014; Garrabé and Feschet 2013; Reitinger et al. 2011) no publication of a complete application is available, while the Guidelines (Benoît and Mazijn 2009) are extensively applied by practitioners (R. Wu, Yang, and Chen 2014; Chhipi-Shrestha, Hewage, and Sadiq 2014). Finally, some have not been applied but have been used by others as a basis to further build on (Dreyer, Hauschild, and Schierbeck 2005; Brent and Labuschagne 2006; Benoît and Mazijn 2009).

From our review, we can conclude the following: on one hand, value-based frameworks and applicability-oriented frameworks assess mainly company practices and context variables, apart from a few indicators reflecting effects, impacts and contextual information (for further details see (Russo Garrido et al. 2016a)). In these frameworks, impacts are thus conceptually not considered, except in the Guidelines, which propose impact categories assessment but do not provide guidance on LCIA.

On the other hand, the other three framework types (context-oriented, theory-structured and impact-based) generally assess or aim to assess effects or impacts of practices/attributes of different entities (companies, activity, and value chain) or of different developments (introduction of a technology, change in the life cycle).

Four frameworks (Brent and Labuschagne 2006; Macombe 2013c; Garrabé and Feschet 2013; Gaasbeek and Meijer 2013) aim to assess effects deduced from comparing a situation with a reference situation. The results of these ex-ante assessments cannot be used on their own but must be used with the results of the reference situation. In these frameworks, an effect is assessed (an effect being the difference between two situations/scenarios), but the assessment does not necessarily go up to the social impact level (i.e. impact experienced by people) is not necessarily an impact pathway-type neither.

For example, the PROSUITE framework (Gaasbeek and Meijer 2013) proposes to assess effects for 11 indicators. The effects on these indicators are then not connected with one of the four identified areas of protection, but are weighted and aggregated to come up with a final social well-being score. Thus, in this framework assessing effects does not imply the use of cause-effect relationships.

In addition, in the PROSUITE framework, indicators are not all located at the same position on the impact pathway; some reflect activities on the product system (e.g., child labor occurrence) and some are positioned further down the impact pathway (e.g., effect on people's trust).

The Multiple Capital Model (MCM) Capacities S-LCA acts differently as it describes the path between an activity related to the product (i.e., indicators of conditions of potential effects of capability) and the final impact (i.e., net marginal *real* effect of capability), but acknowledges that it is only able to assess up to the social effect (i.e., effective potential marginal effect of capability) (Feschet 2014). This framework does not claim to give tools to assess final social impacts, since it depends on the further investigation of impact pathways, and is in line with the suggestion to combine both approaches (i.e., the assessment of practices or performances and the assessment of impacts) ((Chhipi-Shrestha, Hewage, and Sadiq 2014).

While trends emerge in terms of the assessed phenomena according to the type of framework, the analysis carried out on indicators reveals that **a clear line cannot be drawn between frameworks assessing practices/performances and effects/impacts**. Apart from context-oriented and impact-based frameworks which otherwise lack application and development, each type of framework takes or shares parts from the others, resulting in a mix of indicators assessing practices, effect and impacts in almost every framework.

Table 5: Purpose and assessed phenomena

As specified by authors of respective frameworks			As observed	
Framework	Purpose of the assessment Column A	What phenomena are assessed? Column B	What phenomena are assessed? (what do indicators reflect?) Column C	Articulation with impacts Column D
<i>Value-based frameworks</i>				
Guidelines (Benoît and Mazijn 2009)	Various options proposed: e.g., to identify hotspots and improvement options, reduce risks, establish purchasing procedures or specifications, marketing, reporting and labeling, strategic planning, public policies development	S&SE <i>aspects</i> of products and their potential positive and negative <i>impacts</i> along their life cycle	Mainly practices of companies involved in product chains towards 5 stakeholders, also assessed with proxy through contextual variables and a few related effects/impacts <b>(Activity)</b>	Proposition of impact categories to be related to subcategories
Dreyer et al. (2005)	To support business decision-making	Conduct of company towards stakeholders	Practices of companies involved in product chain towards workers <b>(Activity)</b>	Assessment of performances
Kruse et al. (2008)	To inform consumers' personal practices and policymakers' decisions on relative socio-economic costs of comparable products from different production systems	Socioeconomic impacts linked with a production	Mainly company practices towards workers and attributes of the value chain/the industry <b>(Activity)</b>	Not specified
<i>Context-oriented frameworks</i>				
S-LCA participatory approach (Mathe 2014)	To support decision-making	Level of well-being generated by the ecosystem services provided by the industry (Effects/ impacts)	Indicators not specified. Should reflect relation between principles and impacts <b>(Effects/Impacts)</b>	Indicators reflect relation between principles and impacts
Nussbaum capabilities S-LCA (Wangel 2014)	To use S-LCA results as design criteria in the process of constructing a new chain and its enabling context	Variation of functionings of stakeholders through the value chain	Indicators not specified. Should reflect functioning of stakeholders <b>(Effects/Impacts)</b>	To be related to capabilities of stakeholders
<i>Theory-structured frameworks</i>				
Alkire capabilities S-LCA (Reitingier et al. 2011)	To conduct comparative analysis at the level of sector/industry, for strategic analysis, structure complex decision-making processes, identify optimization potentials within an organization	Degrees of freedom and functioning of stakeholders	Inventory indicators of the Guidelines <b>(Activity)</b>	To be related to capabilities of stakeholders and dimensions of life as impact categories
MCM capacities S-LCA (Garabé and Feschet 2013)	<b>Socio- or retrospective design, support to decision making through the identification of consequences of a modification of the social and economic conditions</b> (increase in production volume, new activity, change in the location)	Effects and impacts of an activity on the transformation of individual dotation's of additional functioning capabilities	1 <sup>st</sup> step: measurement of conditions of potential effects of capacity: practices of companies and effect/impacts <b>(Activity and Effects/Impacts)</b>	2 <sup>nd</sup> step: measurement of Marginal and actual potential effect of capacity and 3 <sup>rd</sup> step: Net marginal real effect of capacity => well-being effect

As specified by authors of respective frameworks			As observed	
Framework	Purpose of the assessment Column A	What phenomena are assessed? Column B	What phenomena are assessed? (what do indicators reflect?) Column C	Articulation with impacts Column D
PROSUITE (Gaasbeek and Meijer 2013)	To support decision-making for product developers, policy makers and businesses	Effect of the introduction of a technology	Company practices, effects/impacts on consumers and society/local community <b>(Activity, Effects/Impacts)</b>	To be related to impact categories proposed by Weidema (2005)
<i>Impact-based frames</i>				
Impact pathway (Macombe 2013c)	To support decision-making	Impacts of a change in the functioning of the life cycle of a product	Cause–effect relationship between two indicators reflecting <b>(Activity and Effects/Impacts)</b>	Assessment of impacts
<i>Applicability-oriented frameworks</i>				
Labuschagne et al. (2005)	For business management purposes	Social sustainability of an operational initiative: effects of engineering projects or technologies in the process industry	Practices of companies, effects/impacts on workers and on local community <b>(Activity and Effects/impacts)</b>	Failed attempt to assess potential impacts => performances (Feschet 2014; Chhipi-Shrestha et al. 2014)
AgBalance/SeeBalance (Schoeneboom, Saling, and Gipmans 2012)	To identify options for improvement and to communicate	Current practices and processes, impacts of regulations on products and of farming practices at different levels	Mainly practices of companies involved in the product, a few effects/impacts and economic attributes of companies <b>(Activity)</b>	Assessment of performances
Product Social Metrics (Fontes 2014)	To identify improvement potentials, highlight positive impacts, help decision-making and communicate	Positive and negative impacts of the product on workers, consumers and local communities	Mainly practices of companies involved in product chain and some related effects/impacts <b>(Activity and Effects/impacts)</b>	Assessment of performances
Social Hotspot Database (Benoit-Norris et al. 2012)	To prioritize for where site-specific data collection is most desirable	Identification of hotspots, i.e., production activities or unit processes in the supply chain that may be at risk for social issues	Context in which various actors of the value chain operate which act as contextual information, as proxy of practices and effects/impacts or as social stressors <b>(Context and Activity)</b>	Assessment of potential risk
PSILCA (Ciroth and Eisfeldt 2016)	As for Social Hotspot Database (SHDB)	As for SHDB	As for SHDB	As for SHDB



### **3.3 Scope of assessment C&I**

Based on the life-cycle thinking frame, S-LCA promise is to provide a systemic and holistic assessment of S&SE impacts. The scope of S-LCA in terms of topics, life-cycle stages and stakeholders is thus a relevant issue to look at to better understand the proposed S-LCA frameworks.

Table 6 summarizes the C&I included in the identified frameworks, according to the type of stakeholder and the topics considered. This table has been based on the information gathered in the table located in the electronic supplementary material that details the topical scope of each framework proposing C&I (see Table 1 in Supplementary material 1).

Overall, while value-based and context-oriented frameworks provide some flexibility for including C&I deemed relevant for stakeholders, it is worth noting that theory-structured frameworks help to extend the scope of the set of criteria. For example, the MCM Capacities S-LCA (Garra   and Feschet 2013) includes C&I relating to social, technical, financial and institutional capitals which are not all included in the Guidelines. Similarly, through the stakeholder approach, the Guidelines allow the inclusion of a broad set of topics.

#### **3.3.1 The production stage as the main focus of most frameworks, but unevenly covered**

More specifically, the production stage is that most covered in the reviewed frameworks, and workers are the stakeholder that receives most attention, as highlighted by (J  rgensen et al. 2007). However, workers are not covered similarly according to the frameworks.

While most frameworks include criteria addressing basic standards to be respected, the Product Social Metrics (Fontes 2014) adds positive criteria linked to workers' well-being that can fit better the context of Northern countries.

Also, three frameworks (Schoeneboom, Saling, and Gipmans 2012; Garra   and Feschet 2013; Kruse et al. 2008) include economic C&I relating to companies of the product chain, giving information on its state, costs and profitability.

#### **3.3.2 The consumption stage insufficiently covered, particularly on the consumer side**

On the contrary, the consumption and the use stages are the least covered. An exception to this is the framework of (Wangel 2014) which studies a consumer-driven production system and in which C&I have been defined by consumers themselves. But some other frameworks also include criteria relating to product utility and to consumer satisfaction (e.g., experienced well-being of consumers in (Fontes 2014), health impact and functional product characteristics in (Schoeneboom, Saling, and Gipmans 2012).

However, in the Guidelines and in the MCM Capacities S-LCA, even though some criteria regard consumers (e.g., health and safety, transparency, feedback mechanisms), some significant aspects might be overlooked (e.g., product utility, accessibility, affordability). Regarding the Guidelines, one explanation for this is that product utility is to be included in the functional unit. Another reason could be that only criteria relating directly and entirely to company practices towards other stakeholders (in Beno  t and Mazijn, 2009 or to effects of an economic activity on other stakeholders (in Garra   and Feschet, 2013) are assessed. Thus C&I that are relevant for consumers and rely on contextual information as well (e.g., purchasing power for affordability) would be overlooked. Lastly, the assessment of the affordability criteria requires economic data to be drawn from life-cycle costing, and these are rarely used in S-LCA.

Table 6: Topical and stakeholders coverage

Frameworks Assessment criteria	Guidelines for S-LCA	Kruse et al. (2008)	PROSUIE	MCM capacities S- LCA	Labuschagne et al. (2005)	AgBalance/ SeeBalance	Product social metrics	Social Hotspot Database	PSILCA
<b>Worker</b>									
Company's practices towards workers	X	X	X	X	X	X	X	X	X
Effect/impact on workers	X	X		X	X	X	X	X	X
Context of workers								X	
<b>Consumer</b>									
Company's practices towards consumers	X			X		X	X		X
Effect/impact on consumers			X			X	X		
Characteristics of functional product/service/technology						X			
<b>Local community</b>									
Company's practices towards local community	X		X	X	X		X	X	X
Effect/impact on local community	X		X	X	X		X		
Context of local community	X					X		X	X
<b>Society</b>									
Company's practice towards society	X			X	X			X	X
Effect/impact on society	X	X	X	X	X	X			X
<b>Value chain actors</b>									
Governance aspects of the value chain	X	X		X					X
Economic aspects throughout the value chain		X		X		X			
Economic and financial aspects of separated value chain actors		X		X		X			
Others aspects of separated value chain actors	X			X					

Based on this observation it can be questioned whether these frameworks are able to correctly assess products from non-market-oriented production and consumption activities: e.g., impacts linked to a product grown, processed and consumed on a farm. From Table 6, it appears that the perspective taken by context-oriented, impact-based and other theory-structured frameworks, which aim to assess effects or impacts and with indicators located further down the impact pathway (Wangel 2014; Mathe 2014), makes it possible to assess the whole life cycle, including the consumption stage.

### **3.3.3 The relations between value chain actors and economic aspects at product level overlooked**

Noticeable differences can also be seen regarding the inclusion of C&I relating to the relations between value chain actors. While the Guidelines propose subcategories regarding competition or the relationship with suppliers, the SHDB and the Product social metrics that have been built on the Guidelines, assess company practices of a value chain without considering their relationship to one another. Yet relations with suppliers and clients, as well as market context (competition, concentration), may be important stressors for S&SE impacts. In this regard, approaches of (Kruse et al. 2008), the Guidelines and the MCM Capacities S-LCA of using criteria relating to attributes of the value chain and to value chain governance allow potential additional stressors to be taken into account.

In addition, among the 14 frameworks reviewed, only two allude to fair prices in the criteria to be assessed (Schoeneboom, Saling, and Gipmans 2012; Garrabé and Feschet 2013). Yet, the Guidelines recognize that socioeconomic processes, such as the pressure for low prices, are causes of social impacts, in addition to company's behavior (Benoît and Mazijn 2009).

In conclusion, several of these frameworks do not provide a holistic coverage of life-cycle stages and, without considering consumers and relations between actors in the value chain, do not provide a framework capable of taking a systemic approach. Through the analysis of these frameworks, we can identify how the list of subcategories of the Guidelines could be developed to expand its coverage.

## **4. Conclusion and perspectives**

### **4.1. Conclusions**

Our review first highlights that since the beginning of research on S-LCA in the mid-90s, many methodological S-LCA frameworks have been proposed. These present quite different visions on the purpose of S-LCA and of what an S-LCA should assess. This can be seen in the origin of the C&I part of the frameworks, and in the diverse ways in which they are selected.

In this paper we have identified 14 frameworks, which can be classified in five framework types. With this typology, we identify the main common features and divergences among frameworks regarding the rationale behind the selection of C&I but also regarding the assessed phenomena, with respective strengths and weaknesses: Value- and context-oriented can help build C&I sets that are meaningful and relevant for people and that are legitimate, in contrast to other sets that are defined with one type of stakeholder. Applicability-oriented approaches can help feed frameworks with useable indicators, including for the least-covered stages, such as the use stage. Theory-structured frameworks set a frame that can help to broaden the set of C&I and to articulate C&I with each other, including on the impact pathway. Finally, impact-based frameworks help define C&I that are scientifically legitimate and could help validate/invalidate other C&I sets. Thus, the differences in the selection of assessment C&I result in different sets of C&I that are used for assessment, and thus in different evaluation exercises.

While many of the frameworks mainly focus on practices of companies towards other stakeholders, some others include C&I positioned further down the impact pathway not directly linked to companies' practices and more context related. The topics covered by the selected C&I are also further linked to the assessed phenomena. Generally, phases that correspond to an economic activity are better covered than the use phase. This could be due to the company perspective used (as in (Benoît and Mazijn 2009; Garrabé and Feschet 2013)). In addition, most C&I refer to individual stakeholders, which overlook governance and economic aspects of value chains.

Based on this review, we were also able to identify areas for potential improvement and ways for future development.

#### **4.2 Perspectives and recommendations**

**Specifying the rationale for the selection of C&I.** The review shows that the ways of selecting C&I are very diverse among the various frameworks, resulting in different C&I sets. The diversity is further enhanced by the practitioners of the frameworks who can adapt the C&I set and select C&I for a particular study. Firstly, we would like to call for the rationale for selecting C&I (on framework and application level) to be made more clear, since “too often, the list of indicators is not justified at all” (Iofrida et al. 2016, 12).

**Using legitimate and meaningful for people C&I.** Secondly, we would like to put forward the participatory approach as a potential method for C&I selection. We would encourage the use of assessment criteria that reflect people's values and that are legitimate and meaningful to stakeholders. In fact, if recognized as important by stakeholders, it seems that there is no need of another rationale to justify the inclusion of one criterion or another. We assume that stakeholders will select assessment criteria for different reasons, but there are mainly two: first, they want to protect the elements themselves that are reflected by criteria: these elements have an intrinsic value (Jolliet et al. 2004; Weidema 2006) and correspond to S-LCA midpoint or endpoint categories (e.g., decent working conditions, human health); or, second, they *believe* that certain elements have a positive/negative effect on the elements they want to protect: these elements have an instrumental value and could be considered as stressors of social and socioeconomic impacts (e.g., fair competition).

**Positioning C&I on impact pathways.** In context, we could propose that C&I be classified according to their positions on impact pathways: as midpoint/endpoint impacts, or as stressors. This exercise can be useful in revealing the rationale for the inclusion of one criterion or another in S-LCA: is it included because it is an impact/area to be protected, or because it is thought to have effect on an impact? This exercise could be included in the goal and scope phase, as part of the definition and selection of the C&I to be assessed. This classification would also have implications for the LCIA phase: for midpoint impact variables it could be argued that evaluation using impact pathway methods is preferable. If impossible (or unavailable), a performance assessment remains possible. The relevance of stressor variables should be checked with the investigation of impact pathways linking them with the midpoint and endpoint impacts. This would help to build knowledge about the levers that need to be activated to improve social impacts in product chains.

In fact, as highlighted by our review, several of the reviewed frameworks assess or consider impact pathways, but most of the reviewed frameworks consider assessment criteria separately. In the latter frameworks it is not always clear what the practitioner intends to assess with a certain indicator and where the indicators are positioned on the impact pathway. Our proposal to classify C&I according to

their positions on impact pathways is in accordance with and complementary to the proposal of (Russo Garrido et al. 2016a) for practitioners to specify what phenomena they intend to assess with each indicator, especially for variables that are not found on an impact pathway (i.e., context variables). In this way, practitioners could specify whether the indicators are used *“as contextual information providing insight on potential effects of corporate social performance, as a proxy for a phenomenon occurring within the product system and/or its resulting causality chains, or as an element that may affect/condition activities at the company level”* (Russo Garrido et al. 2016a, 5).

**Integrating and investigating the link between impact variables and stressor variables.** C&I classified as stressor variables should not be left apart, but should actually be integrated in the assessment. Indeed, most frameworks identified in this review propose to go up to the assessment and reporting of (midpoint) impacts (i.e., company practices toward other stakeholders or the Guidelines subcategories in Type I LCIA, e.g., working conditions). However, it has been argued that impacts affected by these midpoint impact categories (e.g., well-being impact) should be assessed as well, e.g. through the investigation of impact pathways (Macombe 2013c; Feschet 2014). We argue here that in addition to assessing affected (downstream) impacts, it would be useful to look into the reasons why (upstream) a certain midpoint impact is at a certain impact level or performance (e.g., socioeconomic processes, such as pressure for low prices, can be the reason for poor working conditions). We believe that looking into these reasons could increase S-LCA’s potential to identify improvement options. This would imply looking for and integrating stressors of midpoint impacts (i.e., instrumental variables) in the assessment. Therefore we would like to encourage the ‘impact pathways research’ to look into the link between midpoint impact variables and related (upstream) stressors.

Among the reviewed frameworks we already found C&I that could be considered as social stressors, i.e., elements influencing or constraining company practices and therefore affecting and explaining impacts: e.g., relation between value chain actors (Benoît and Mazijn 2009; Garrabé and Feschet 2013), market context (Kruse et al. 2008), economic aspects throughout the value chain (e.g., fair price) and of separated value chain actors (e.g., profits) (Garrabé and Feschet 2013; Kruse et al. 2008; Schoeneboom, Saling, and Gipmans 2012). In fact, from a systemic approach, S&SE impacts are obviously drawn not only from social and organizational aspects of chains, but also from governance and economic aspects. By integrating such stressors into the S-LCA methodology, we could strengthen the capacity of S-LCA to contribute to sustainability management and further the fulfillment of the S-LCA promise to provide a holistic assessment where the variables are considered as elements of a system that are linked with other elements of the system.

## Supplementary material 1: Detailed topical and stakeholder coverage of selected frameworks

Criteria Subcategories	Frameworks	Guidelines	Kruse et al. (2008)	Prosuite	MCM capacities S-LCA	Labuschagne et al. (2005)	AgBalance/ SeeBalance	PSM	SHDB	PSILCA
<b>WORKERS</b>										
<b>Company's practices towards workers</b>										
Freedom of association and collective bargaining		X	X		X			X	X	X
Child labor		X	X	X	X		X	X	X	X
Fair salary		X	X		X	X	X	X	X	X
Working hours		X	X		X			X	X	X
Forced labor		X	X	X				X	X	X
Equal opportunities/ discrimination		X	X		X	X	X	X	X	X
Social benefits/security		X	X		X		X	X		X
Health and safety		X			X					
Training and education					X		X	X		
Employment relationship					X	X		X		
Possibility of part-time work							X			
Employment opportunities and career development						X				
Conditions of the workplace			X			X				
Gender/origin of employees			X			X				
Arduousness of the work					X					
Social dialogue					X					
Respectful treatment					X					
Measures to improve integration of migrants					X					

Criteria/ Subcategories	Frameworks	Guidelines	Kruse et al. (2008)	Prosuite	MCM capacities S-LCA	Labuschagne et al. (2005)	AgBalance/ SeeBalance	PSM	SHDB	PSILCA
<b>Effect/impact on workers</b>										
Health and safety		X	X		X	X	X	X	X	X
Work–life balance								X		
Job satisfaction and engagement								X		
Strikes and lockouts							X			
Association memberships							X			
Access to health, education						X				
<b>Context (poverty, employment, regulations) of workers</b>										
Poverty									X	
Unemployment									X	
Labor laws/conventions									X	
Legal system									X	
<b>CONSUMER</b>										
<b>Company's practices towards consumers</b>										
Health and safety		X					X	X		X
Feedback mechanism		X			X					
Consumer privacy		X			X					
Transparency		X								X
End-of-life responsibility		X								X
Fair practices (on product quality, information)					X					
<b>Effect/impact on consumers</b>										
Health and safety							X	X		
Experienced well-being								X		
Change in risk perception				X						
Possibility of misuse				X						
Functional product characteristics							X			

Criteria/Subcategories	Frameworks	Guidelines	Kruse et al. (2008)	Prosuite	MCM capacities S-LCA	Labuschagne et al. (2005)	AgBalance/ SeeBalance	PSM	SHDB	PSILCA
<b>LOCAL COMMUNITY</b>										
<b>Company's practices towards local community</b>										
Access to material resources		X				X		X		X
Access to immaterial resources		X			X					
Delocalization and migration		X								X
Cultural heritage		X								
Respect of indigenous rights		X							X	X
Community engagement		X						X		
Local employment		X			X	X		X		X
Purchase of local goods										X
Stakeholder involvement				X	X	X				
<b>Effect/impact on local community</b>										
Safe and healthy living conditions		X				X		X		
Secure living conditions		X								
Infrastructure development					X					
Trust				X		X				
<b>Context of local community</b>										
Indigenous rights									X	X
Gender equity									X	
High conflict zone		X							X	
Human health									X	X
Access to education									X	X
Access to basic sanitary needs and health facilities		X							X	X
Economic situation										X
Product trade balance							X			



Criteria/Subcategories	Frameworks	Guidelines	Kruse et al. (2008)	Prosuite	MCM capacities S-LCA	Labuschagne et al. (2005)	AgBalance/ SeeBalance	PSM	SHDB	PSILCA
<b>SOCIETY</b>										
<b>Company's practices towards society</b>										
Public commitment to sustainability issues		X			X					
Responsibility regarding external effects					X					
Prevention and mitigation of armed conflicts		X								X
Technology development		X								
Corruption		X			X				X	X
Payment of taxes					X	X				
Cooperation with NGOs					X					
<b>Effect/impact on society</b>										
Contribution to economic development		X				X				X
Contribution to employment (incl. qualified jobs)			X	X		X	X			
Inequalities				X						
Fair treatment and equal opportunities					X					
Improvement of the environment						X				
<b>VALUE CHAIN ACTORS</b>										
<b>Governance aspects of the value chain</b>										
Fair competition		X			X					X
Promoting social responsibility		X								X
Supplier relationships		X			X					X
Autonomy in terms of price setting					X					
Access to suppliers and possibility to buy and sell freely					X					

Criteria/Subcategories	Frameworks	Guidelines	Kruse et al. (2008)	Prosuite	MCM capacities S-LCA	Labuschagne et al. (2005)	AgBalance/ SeeBalance	PSM	SHDB	PSILCA
Distance travelled between activities in the value chain			X							
Industry concentration			X							
<b>Economic aspects throughout the value chain</b>										
Fair producer price					X		X			
Value added			X		X					
Production costs			X				X			
<b>Economic and financial aspects of separated value chain actors</b>										
Industry accessibility and attractiveness			X				X			
Investments					X		X			
Subsidies					X		X			
Other financial aspects (profits, own equity, taxes, savings, credits, wages)					X					
<b>Others aspects of separated value chain actors</b>										
Respect of intellectual property rights		X								
Choice in terms of production, partnerships, communication					X					
Participation in public and private decision making					X					
Access to information and research					X					
Use of support networks and production of information					X					
Access to public services and jurisdictions					X					
Access to and respect of protective, monitoring, regulation, hedging & arbitration rules					X					

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## CHAPTER 2: How social impacts are assessed in S-LCA? A review of type II or impact pathway approaches

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Adapted from Sureau, Solène, Sabrina Neugebauer, and Wouter M. J. Achten. 2020. "Different Paths in Social Life Cycle Impact Assessment (S-LCIA)—a Classification of Type II Impact Pathway Approaches." *The International Journal of Life Cycle Assessment* 25 (2): 382–93. <https://doi.org/10.1007/s11367-019-01693-9>.

### 1. Introduction and background

In S-LCA, the way to carry out the third phase of the analysis, the impact assessment (or LCIA), is not streamlined, and there are two main approaches that are called Type I and Type II (Benoît and Mazijn 2009). The definitions of these two approaches are not set in stone and vary according to S-LCA researchers and practitioners.

However, we highlight two main differences. The first one is the use of impact pathways or cause-effect chains in the analysis, which is typical for Type II LCIA. In type II LCIA, researchers or practitioners consider the link between two or more phenomena or events in the assessment (e.g. the use of an input or the exposure to certain working conditions in a production process and health impacts on workers). In Type I LCIA, such link is not considered. Rather, Type I LCIA assesses performances, and collected data is compared with performance reference points (e.g. the number of hours worked per worker weekly is compared with the statutory working time) (Parent, Cucuzzella, and Revéret 2010).

At the beginning of the research on S-LCA, a number of studies investigated the inclusion of impact pathways (Norris 2006; Weidema 2006; Hutchins and Sutherland 2008). Then, from 2009 onwards, studies that we can classify as Type I have been developed, mainly boosted by the publication of the Guidelines for S-LCA (Benoît and Mazijn 2009) and its list of subcategories or criteria to be assessed. One reason for this development might be that impact pathways in S-LCA cannot be described the same way as in E-LCA, as the E-LCA LCIA approach of underlying physical and natural science cannot be directly transposed. Indeed, impact assessment in E-LCA and S-LCA call partly upon different disciplines and methods. While practitioners in E-LCA deal with physical phenomena and quantitative data, in S-LCA they deal mainly with social and socioeconomic phenomena and partly with qualitative data.

Type I S-LCIA has a close linkage to social reporting approach, such as Corporate Social Responsibility standards (ISO n.d.) (Feschet 2014). Yet, when impact pathways are considered and impacts are assessed, S-LCA can be used as a tool to predict impacts stemming from product life cycles or from changes in product life cycles, and thus as a decision-support tool (Macombe 2013c) or as a tool that can help understand practices of life cycle organizations (Sureau et al. 2017; chapter 1). Indeed, when phenomena are linked through variables, then it becomes possible to look for explanations of negative impacts, and thus for levers that can foster the improvement of impacts.

Parallel to this boom in Type I S-LCA publications (R. Wu, Yang, and Chen 2014), Type II or impact pathway approaches continued developing in many directions. A number of literature reviews listed and proposed broad classifications of various studies into Type I or Type II (Parent, Cucuzzella, and Revéret 2010; Feschet 2014; R. Wu, Yang, and Chen 2014; Chhipi-Shrestha, Hewage, and Sadiq 2014; Neugebauer 2016). These works of characterization and classification are very useful, all the more so because the terminology used by researchers reflects quite often different views and realities (e.g. researchers use the terms "characterization", "impact assessment" or "social impacts" whether they

adopt a Type I or a Type II approaches, while what they actually assess and do is quite different). Some of these reviews provide a broad classification of Type II studies, into two main branches mainly, which are different according to each author. (R. Wu, Yang, and Chen 2014) distinguish between ‘multiple qualitatively constructed pathways with expert knowledge’ and ‘single and quantitative pathways’, (Chhipi-Shrestha, Hewage, and Sadiq 2014) distinguish between E-LCI Database Method and Empirical method, whereas (Neugebauer 2016) distinguishes between type II/impact pathways and type III/economic modelling. These classification studies will be discussed and compared to the classification we propose in this chapter (cf. Discussion).

Next to the publication of the above-mentioned literature reviews, other studies were published proposing, applying or discussing different approaches within the Type II impact pathway methodology (Touceda, Neila, and Degrez 2016; Silveri 2016; Di Cesare 2016; Weidema 2018a; Neugebauer et al. 2016; S. R. Wu et al. 2015; Arvidsson et al. 2016; Weidema 2018b; Sureau and Achten 2018 or chapter 4 and 5; Iofrida et al. 2019). These studies and the previous ones are very different from each other, in their purposes, scopes and methods. However, there is as yet no detailed review and characterization of their common features and differences, while this work has already been achieved for Type I studies (Russo Garrido et al. 2016b). (Russo Garrido et al. 2016b) further add on the earlier review papers and highlight what additionally distinguishes Type I and Type II studies. Thus, in Type I, the inventory data and the “characterized”, or referenced result<sup>30</sup> are at the same point along the impact pathway, and in type II, they are at different points along the impact pathway (cf. Figure 11). We will use this distinction between Type I and Type II S-LCIA as a reference for our review. Adding further to the work of (Russo Garrido et al. 2016b), this study will highlight the diversity of Type II S-LCIA approaches by providing a comprehensive classification.

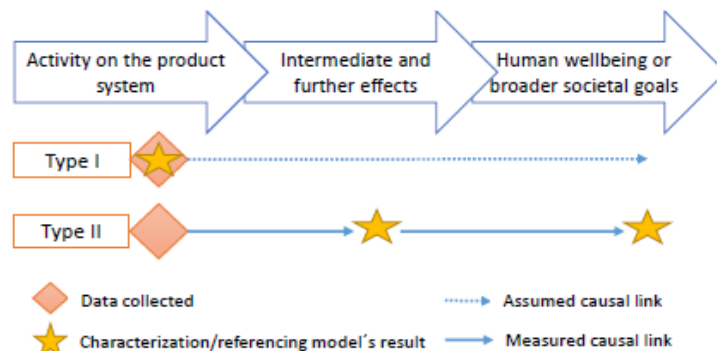


Figure 11: Positioning of Type I and II inventory data and characterization/referencing results on the impact pathway in the framework of S-LCA (adapted from Russo Garrido et al. (2016))

After introducing the materials and methods used, we present the results providing detailed classification and description of the various Type II approaches. Then, we discuss these results through a comparison with other (earlier) classifications. Finally, we give recommendations for future research on impact pathways in S-LCA.

<sup>30</sup> In type I studies, referring to characterization is not correct since there is no characterization per se (as in E-LCA), but rather a referencing with performance reference points (i.e. generally a translation from qualitative to semi-quantitative variables)

## 2. Materials and method

### 2.1 Materials

As a basis of our review, we list the studies identified as Type II approaches by other literature reviews, complemented by further and more recent studies which we judge to be corresponding to Type II. Focus is set on peer-reviewed articles published in international journals; however, for the sake of completeness, recent articles published on the topic in e.g. conference proceedings are as well included. In the end, our literature review covers 28 studies or research works (cf. Table 7).

*Table 7 : List of reviewed studies (listed in the order of publication date)*

Author(s) and year	Title of study
(Hoffstetter and Norris 2003)	Why and How Should We Assess Occupational Health Impacts in Integrated Product Policy?
(Weidema 2006)	The Integration of Economic and Social Aspects in Life Cycle Impact Assessment
(Brent and Labuschagne 2006)	Social Indicators for Sustainable Project and Technology Life Cycle Management in the Process Industry
(Dreyer et al. 2006)	A Framework for Social Life Cycle Impact Assessment
(Norris 2006)	Social Impacts in Product Life Cycles - Towards Life Cycle Attribute Assessment
(Hunkeler 2006)	Societal LCA Methodology and Case Study (12 pp)
(Hutchins and Sutherland 2008)	An exploration of measures of social sustainability and their application to supply chain decisions
(Jørgensen et al. 2009)	Assessing the validity of impact pathways for child labour and well-being in social life cycle assessment
(Jørgensen et al. 2010)	Defining the baseline in social life cycle assessment
(Moriizumi et al. 2010)	Simplified life cycle sustainability assessment of mangrove management: a case of plantation on wastelands in Thailand
(Feschet et al. 2012)	Social impact assessment in LCA using the Preston pathway
(Menikpura, et al. 2012)	Framework for life cycle sustainability assessment of municipal solid waste management systems with an application to a case study in Thailand
(Lagarde and Macombe 2012)	Designing the social life cycle of products from the systematic competitive model
(Baumann et al. 2013)	Does the Production of an Airbag Injure more People than the Airbag Saves in Traffic?
(Arvidsson et al. 2014)	On the scientific justification of the use of working hours, child labour and property rights in social life cycle assessment: three topical reviews
(Neugebauer et al. 2014)	Impact Pathways to Address Social Well-Being and Social Justice in S-LCA—Fair Wage and Level of Education
(Bocoum et al. 2015)	Anticipating impacts on health based on changes in income inequality caused by life cycles
(Wu et al. 2015)	Causality in social life cycle impact assessment (SLCIA)
(Musaazi et al. 2015)	Quantification of social equity in life cycle assessment for increased sustainable production of sanitary products in Uganda
(Weidema 2016)	The social footprint—a practical approach to comprehensive and consistent social LCA
(Silveri 2016)	Anticipating Psychosocial Factors Effects in the agri-food sector: the Siegrist's Pathway
(Di Cesare et al. 2016)	Farmworkers' pesticides exposition assessment: the Wesseling pathway
(Arvidsson et al. 2016)	A method for human health impact assessment in social LCA: lessons from three case studies
(Touceda Gomez 2016)	Implementation of socioeconomic criteria in a Life cycle sustainability assessment framework applied to housing retrofitting - The Brussels-capital region case study
(Neugebauer et al. 2016)	Calculation of Fair wage potentials along products' life cycle – Introduction of a new midpoint impact category for social life cycle assessment
(Weidema 2018b)	Towards a taxonomy for social impact pathway indicators
(Sureau and Achten 2018) or chapter 4 and 5	Including chain governance and economic aspects to assess and explain social impacts: a methodological proposal for S-LCA
(Iofrida et al. 2019)	Psychosocial risk factors' impact pathway for social life cycle assessment: an application to citrus life cycles in South Italy

## 2.2 Method

For the evaluation we analyze the 28 studies under consideration against the following criteria:

- Purpose of the article/the research on impact pathways: e.g. is the article proposing impact pathways, investigating an impact pathway, implementing a case study;
- Method used to deal with impact pathways: e.g. is a statistical approach, or literature review;
- Issues/variables used/investigated: e.g. number of variables and aspects/topics covered (such as health impacts, economic aspects, other aspects);
- Data collection/origin of the result: how are the data/result obtained, i.e. measurement with observed data (statistics or on-site collection) or calculation (implying a characterization).

On this basis, we analyze common features within the approaches as well as the main differences, considering the first criterion *i. Purpose of the research* as a main entry point, as it seemed to determine several other characteristics included in the approaches. In addition, to determine whether the selected articles correspond indeed to Type II S-LCA, we check against the three following characteristics:

- the reflection of an impact pathway;
- the availability of so-called inventory and impact indicators;
- the presence of characterization models or factors translating correlations or causality.

## 3. Results

Through the criteria and defined characteristics, we identify three main paths of Type II S-LCA studies (see Figure 12).

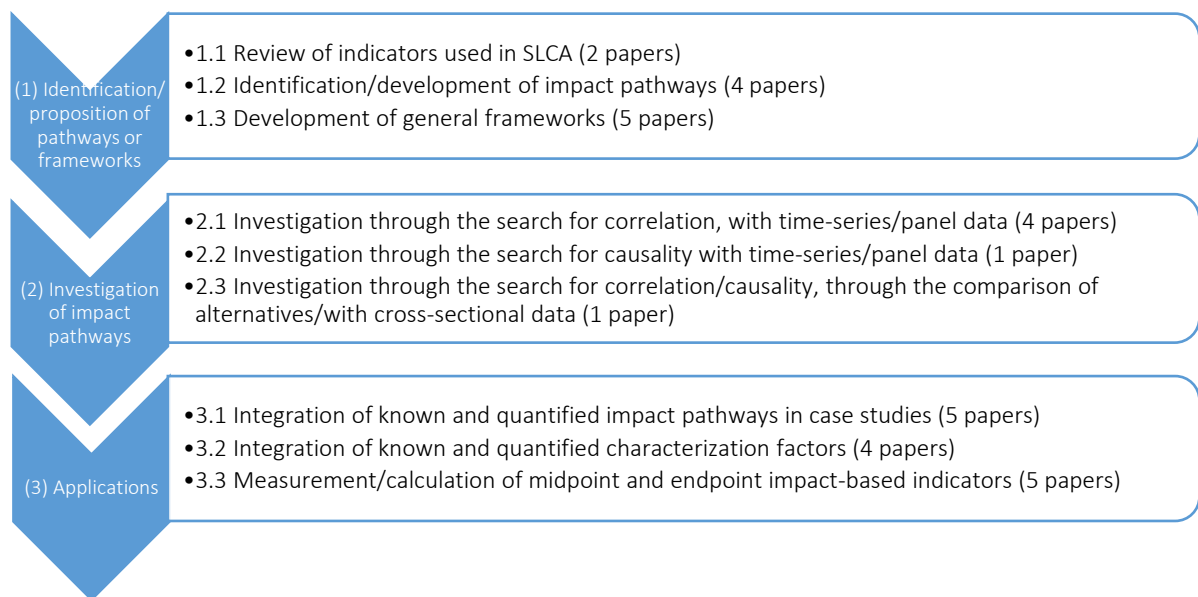


Figure 12 : Illustration of the 3 main paths and nine general approaches identified in Type II studies.  
Note: some studies apply to more than one approach

In the first path we summarize studies targeting the identification or proposition of impact pathways (e.g. impact pathways relating to unemployment in (Jørgensen et al. 2010)) or frameworks (e.g. the general one of Weidema 2006); the second path displays studies investigating impact pathways (e.g. the Preston pathway in Feschet et al. 2012); and the third path includes approaches applying existing and known impact pathways, characterization models or factors from other research works or

calculating impacts at a midpoint or endpoint level (e.g. the three case studies of Arvidsson et al. 2016).<sup>31</sup> A more detailed description of all reviewed studies and approaches can be taken from Supplementary material 2. Within each path we can distinguish nine (9) general approaches, which are detailed below.

### ***3.1 Identification or proposition of pathways or frameworks***

Studies classified under the first path identify/develop/propose impact pathways and/or frameworks. Some of the studies also implement a case study (e.g. Neugebauer et al. 2016), which however does not constitute the core of the article, but is rather meant as a justification of the preliminary work undertaken. One of the studies investigates impact pathways as well (Weidema 2006), but it seems that the core of the work is to provide a comprehensive and coherent framework rather than to test it.

Among this first path, we distinguish three different approaches. Studies gathered under **Approach 1.1** review assessment criteria used in Type I S-LCA (e.g. Guidelines' subcategories) and check whether these criteria are relevant/suitable in relation to impact pathways to be investigated. (Jørgensen, Lai, and Hauschild 2009) investigate the impacts of child labor on the basis of an extensive literature review including various research fields (e.g. social science), and (Arvidsson et al. 2014) undertake a similar approach extending child labor to working hours and property rights. Both studies highlight how research done in these different fields may benefit and feed S-LCA. Although the research undertaken does not target a specific application, it seems to be a prerequisite for developing and applying (concrete) impact pathways. It may further be useful to justify the use of indicators in Type I S-LCA.

Studies classified under **Approach 1.2** use similar methods as studies from the first approach, but aim to define/build single/specific impact pathways, rather than solely checking the relevance of used assessment criteria. They build on existing research, e.g. by using literature reviews (Jørgensen et al. 2010, who look at the various impacts of unemployment), by integrating specific theoretical frameworks (Sureau and Achten 2018; chapter 4 and 5, who link product chain governance and working conditions along the chain), by using external sources such as expert knowledge on the pathway to be documented (Di Cesare, 2016 who looks at how the exposure to pesticides impacts health of farm workers, or by combining several ways (Silveri, 2016, who looks at the factors influencing occupational health).

While studies of the 1.2 approach define single impact pathways, studies listed under **Approach 1.3** propose general frameworks to conduct S-LCA that include several impact pathways linking inventory indicators, midpoint, endpoint impacts and/or areas of protection. Frameworks can equate to a taxonomy, which purpose is "to provide structure and conceptual clarity to a scientific domain through clear definitions of hierarchically organized concepts" (Weidema 2018b, 1). Most of these works (Brent and Labuschagne 2006; Dreyer, Hauschild, and Schierbeck 2005; Weidema 2018b; 2006) adopt a top-down approach, propose areas of protection and endpoint categories that are to be linked to inventory indicators and seek to provide a comprehensive picture. As an example, Weidema (2006) proposes 14 quantitative social pressure inventory indicators to be linked to six damage areas including life and longevity, health, autonomy, safety, security and tranquility, equal opportunities, participation and influence. The study of (Neugebauer, Traverso, et al. 2014) on the other hand focuses on two specific midpoint categories (fair wage and education) and proposes specific impact pathways related to these two categories, linking inventory indicators to the included AoPs (i.e. social well-being and social justice). In approaches 1.1, 1.2 and 1.3, variables composing impact pathways are *identified and proposed*.

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<sup>31</sup> These 3 paths are not to be understood as subsequent steps, but as a way to highlight the authors' intentions within their studies. However, the studies relating to the different paths may benefit from each other and one may be used as the basis for further studies.

### 3.2 Investigation of impact pathways

In this second path, researchers investigate impact pathways that have already been identified by researchers in other disciplines. The idea is to prove empirically their existence or even to quantify the relationship between two or more variables, in order to be able to use the characterization factor in case studies. Most of the time, the model is then applied to a case study. To achieve this, authors look for correlations or causality between two or more variables with time series and/or panel econometric modeling. Once the correlation or causality has been proven, it can be used to predict a change in the impact variable (e.g. health impacts) if the explanatory variable changes (e.g. income) or to compare alternatives (Hutchins and Sutherland 2008). For now, studies using econometric modeling focus on the relation between incomes or income inequality linked to the product life cycle and health impacts (life expectancy or child mortality rate).

At a methodological level, a distinction has been made by (Neugebauer et al. (2016) and Bonacina De Auraujo and Ugaya (2018) between studies inferring correlation (**approach 2.1**) and those inferring causality (**approach 2.2**): simple and multiple regression modelling makes it possible to prove a correlation (as in Norris 2006; Hutchins and Sutherland 2008; Feschet et al. 2012; Bocoum, Macombe, and Revéret 2015), while Structural Equation Modelling (SEM, as used in only one study, Wu et al., 2015); makes it possible to establish causality. Indeed, “in SEM, it is possible to analyze several dependency relations simultaneously”, with several explanatory and explained variables (Bonacina De Auraujo and Ugaya 2018, 69). Rather, simple and multiple regression analyze the relationship between several explanatory variables and a single explained variable, and “do not allow the identification of factors” or latent variables, but “the prediction of the [explained] variables, through the determination of coefficients” (Bonacina De Auraujo and Ugaya 2018, 69). What brings together approaches 2.1 and 2.2 is the use of what Neugebauer, (2016) call “consequential modelling” to investigate impact pathways: researchers compare two situations, before and after a change in the product life cycle, and they look for co-variations of two or more indicators during a time period. The study of Feschet et al., (2012) illustrates what is done in approach 2.1: the characterization factor linking GDP per capita and life expectancy is calculated with a simple regression, on the basis of panel data from 107 countries, as well as its conditions for use. The study of Wu et al. (2015) extends the work of Feschet et al. (2012) and provides an example of the approach 2.2 by identifying with SEM two latent variables, health expenditures and health access, that mediate the impact pathway from GDP to life expectancy.

(Hofstetter and Norris 2003) take a different approach to investigate impact pathways: they compare alternatives (**approach 2.3**). The idea is to compare the S-LCA results of product life cycles which differ on one (or more) parameter(s) and to determine from this whether this changing parameter is decisive and can be considered as an explanatory factor, as well as to potentially identify other explanatory parameters. In their study, (Hofstetter and Norris 2003) investigate the pathway “differences in worker health according to sectors” (Feschet 2014) by comparing the number of occupational injuries and illness in two sectors (steel and plastic) producing the same product (fuel tank systems for cars). However, the type of data used is the same as in 2.1, 2.2 and 2.3 since they use generic data/statistics at a sectoral level.

In approaches 2.1, 2.2 and 2.3, so-called inventory and impacts data are *observed* through statistics and from these impact pathways are investigated or tested.



### 3.3 Applications

Studies of the third path are applications. These applications include three approaches, for which the use of impact pathways vary: some studies apply existing and already quantified impact pathways (3.1), some others apply characterization factors (3.2) and some others calculate impacts at midpoint or endpoint levels (3.3). While some of the studies adopt the same approach for all indicators (approach 3.1 for Iofrida et al. 2019), other studies adopt different approaches according to indicators (approaches 3.1 and 3.3 for Arvidsson et al. 2016; Touceda, Neila, and Degrez 2016, approaches 3.1 and 3.2 for Menikpura, Gheewala, and Bonnet 2012); these latter studies are therefore found in different approaches.

**In the approach (3.1),** practitioners apply already known and already quantified impact pathways (meaning that a characterization factor has already been calculated) and calculate impact indicators. Arvidsson et al., (2016), Baumann et al. (2013), and Touceda et al., (2016) use the inventory made in the framework of an Environmental LCA (i.e. E-LCI, physical inputs and outputs linked to a product life cycle) to calculate health impacts. These studies include health impacts related to human toxicity only (e.g. Baumann et al. 2013) or to other E-LCA impact categories as well (Arvidsson et al. 2016). While (Touceda, Neila, and Degrez 2016) include impacts from near-field environment for the product use phase (as opposed to impacts from far-field environment, see (Huang et al. 2017)), it is not clear whether these impacts are taken into account in other studies of 3.1 group. (Iofrida et al. 2019) use existing researches in medical sciences mainly to assess health impacts on workers exposed to specific working conditions. Instead of using the composite indicator DALY, (Iofrida et al. 2019) keep results disaggregated and highlight links between specific working conditions (e.g. long working hours) and specific diseases (e.g. metabolic syndrome). In this approach, impact results are calculated, since they are obtained after applying a characterization factor linking two distinct variables or phenomena.

**In approach (3.2),** characterization factors are also used to calculate impacts. However, these characterization factors link variables or phenomena which, on the impact pathway, are closer to each other or are less distinct than the ones described in (3.1) approaches. Hunkeler (2006); Menikpura et al. (2012); Musaazi et al. (2015) and Weidema (2016) calculate the impact of incomes generated by the product life cycle on access for stakeholders to basic needs or utility with respectively cost of living in various countries and elasticity of marginal utility of income (i.e. characterization factors). The idea behind these approaches is that a same monetary flow will have a different impact if earned and spent in a poor country or in a rich country. In this sense, rather than to calculate impacts from an inventory indicator with the support of a characterization factor, studies of the 3.2 approach put inventory data in perspective (e.g. income generated by the product life cycle), with the support of specific data (e.g. cost of living in the country).

**In the approach (3.3)** practitioners assess midpoint or endpoint impact-based indicators but without the explicit use of impact pathways. It means that indicators are assessed alone and are not linked to a stressor or an inventory indicator. It means that features of impact pathways (predicting or explaining impacts) cannot be used since no link is established between two phenomena. This approach seems rather a reporting approach. However, these approaches are included in this review since the used indicators do not reflect an activity on the product system, i.e. behavior of life cycle organizations or consumers, but rather (measure) effects located further on the impact pathway. In addition, for these impacts no referencing is made (as would happen in type I). Finally, these impacts are assessed together with other impacts, which on the contrary are calculated with the use of impact pathways. Therefore, these studies are considered type II studies and are on the radar of this review. Indicators concerned

with this approach are mainly of three kinds: DALY (Arvidsson et al. 2016; Baumann et al. 2013; Touceda, Neila, and Degrez 2016), number of jobs (Lagarde and Macombe 2012), and other composite indicators (Touceda, Neila, and Degrez 2016). In the case of (Touceda, Neila, and Degrez 2016), indicators are composite and gather various collected data. (Lagarde and Macombe 2012) use a single indicator summing up job creations and destructions resulting from of a change in a product life cycle which has impact on demand for competitors. Thus, in this latter study, we find again a consequential modelling, however, in this case, the link between two indicators is not done as it is done by e.g. (Feschet et al. 2012), who investigate the link between GDP per capita and life expectancy. For the rest of studies classified in (3.3), impacts are actually *observed and measured* (including in statistics) and are not the result of a characterization.

## 4. Discussion

### 4.1 About other classifications

Our classification shares common characteristics with previous classifications, but also differences, as detailed in Table 8. With the here proposed classification we add detail on the currently existing classifications regarding Type II SLCA.

Table 8: Classification proposed in this study compared to other existing classifications

Our classification		Macombe (2013) Pathways:	Wu et al. (2014) Pathways:	Chhipi-Shrestha et al. (2014) Methods:	(Neugebauer 2016)	(Bonacina De Auraujo and Ugaya 2018)
Identification/p roposition of pathways/ frameworks	Review of indicators used in type I S-LCA (1.1)		Multiple qualitative			
	Identification/building of impact pathways (1.2)	Pathway 2			Type II/III	
	Development of theoretical frameworks (1.3)		Multiple qualitative	Empirical	Type II	
Investigation of impact pathways	Investigation through the search for correlation (2.1)	Pathway 1	Single and quantitative	Empirical	Type III	Simple and multiple regression
	Investigation through the search for causal inference (2.2)				Type II	Structural equations modelling
	Investigation through the comparison of alternatives (2.3)					
Applications	Application of impact pathways (3.1)	Pathway 2		E-LCI database	Type II	
	Application of characterization factors (3.2)			E-LCI database	Type II	
	Application of impact-based indicators (3.3)	Pathway 3		Empirical/E-LCI database	Type II	

Wu et al. (2014) distinguish single and multiple impact pathways, while Wu et al (2015) distinguishes between quantitative and qualitatively constructed impact pathway with expert knowledge (S. R. Wu et al. 2015). Qualitatively constructed impact pathways correspond to studies identifying or proposing pathways or frameworks (1). Single quantitative impact pathways correspond to studies investigating pathways either through the search for correlation (2.1) or the search for causal inference (2.2). Chhipi-Shrestha et al. (2014) simply distinguish the method which uses environmental LCI databases to estimate social impacts and the empirical methods. However, the “empirical method” which is defined as involving “the use of empirical formulas or rules in order to assess social impacts” appears to encompass very different methods. We found that studies under that category can be either grouped

under 1.3 (*development of theoretical frameworks*), 2.1 (*investigation of impact pathways*), or 3.3 (*measurement of impact indicators*). Studies using environmental LCI databases correspond to two types: *applications of impact pathways* (3.1), but also to *measurements of impact-based indicators* (3.3). As regards the classification of (Macombe 2013c): Pathway 1 that is based on a formalized mathematical relation can be classified under *investigation of impact pathways through the search for correlations* (2.1), Pathway 2 that presents a matrix of known results on relations can be classified under *identification/building of impact pathways* (1.2), and Pathway 3 which assesses social effects corresponds to *measurement of impact-based indicators* (3.3).

More recently, (Neugebauer 2016) and (Bonacina De Auraujo and Ugaya 2018) put apart Type II studies looking for correlation between variables (Norris 2006; Hutchins and Sutherland 2008; Feschet et al. 2012) from those looking for causal inference (S. R. Wu et al. 2015), with a new dedicated category (Type III) as proposed in (Neugebauer 2016). We consider that approaches investigating impact pathways through the search for correlation classified in (2.1) (or in Type III S-LCA according to (Neugebauer 2016)), which use simple and multiple regressions, are consistent with the impact pathway approach. The objective of these is to reveal/highlight empirical causal relations between phenomena and to quantify them, through the search for correlations. Simple and multiple regressions are one of the methods used by social scientists to analyze causal relations. It does not allow to infer causality, but so are most almost all methods in social sciences which are not experiments. Experiments are in fact the only effective way to infer causality, since it is the only way to isolate the effect from a specific cause, but they can rarely be used in social sciences (Behaghel 2006). S-LCA being partly based on findings from social sciences, investigation of impact pathways through the search for correlation can be regarded as type II.

#### **4.2 About a definition for Type II S-LCA**

Coming from the distinction made by (Russo Garrido et al. 2016b) between Type I and Type II, our findings underline the differences between the two approaches (Type I and II) for social life cycle impact assessment. Furthermore, our investigation allows to encompass the diversity of approaches in studies stamped as Type II. Purposes, covered impacts, data collection, result obtaining methods and identification/investigation methods differ greatly. However, what gathers all those Type II studies is to not consider phenomena or impacts in isolation but the search to link them to the source(s) of the impacts, or to further impacts or social aspects. According to this definition, we believe that Type II S-LCIA is not only about quantitative indicators, nor about measuring endpoint impacts, but about using impact pathways i.e. pathways linking interconnected phenomena, also with rather qualitative approaches.

Thus, we judge qualitative approaches described and studies classified in the first path (Identification/proposition of pathways or frameworks) consistent with Type II S-LCA. Even though not quantitative, these studies consider existing research from different fields, often social sciences, to review or build pathways for relevant social phenomena considered within the S-LCA framework. They further expand the coverage of the topics that are commonly covered in S-LCA impact pathway approaches.

Studies using quantitative variables, such as studies measuring impact indicators at a midpoint or endpoint level (e.g. DALY that we classify under the approach 3.3) are not necessarily studies using the impact pathway approach. For example, some studies provide results on the number of deaths occurring in a product process, thanks to company's reporting on occupational accidents. However, this

number of death is not related to specific inputs or tasks in the process. Using impact pathways implies investigating the connection between two phenomena or events: in the S-LCA field, connecting a company's practice to its effect on people or to its source. This feature for a long time was seen as one of the main strengths of the E-LCA approach since it allows to be aware of problem's sources and consequently derive improvement potentials from it. This is a key reason for continuing research on Type II S-LCA approaches targeting the further development and integration of impact pathways. However, in the study of (Arvidsson et al. 2016), in the impact assessment for the use life cycle phase the underlying impact pathway is not mentioned. This may lead to inconsistent results, as they are obtained in different ways (observed data versus data obtained after a characterization). It may on the one hand increase the scope of these studies (by including further issues or life cycle phases), but may at the same time be a source of unclarity.

### **4.3 Recommendations**

#### **On the use of the proposed classification**

Starting from the within, this study presented a clearer picture on the different approaches in Type II S-LCA. Our results can be used to identify or prioritize future research fields of Type II S-LCA or S-LCA in general. The classification can also help in clarifying the intention and/or objective of researchers or practitioners before they start with their work in the context of Type II S-LCIA. For instance, do they seek to identify or propose variables composing impact pathways, to investigate or test proposed impact pathways or to apply known pathways or characterization factors? Examples on the different approaches can be read in the Supplementary material 2 in accordance with our classification, which may serve as a good starting point for further investigations.

Once the purpose of the research work is set, it could be interesting to specify the method used, the way that data/result is obtained (at the start and at the end of the impact pathway) and the investigated phenomena composing the impact pathway. The present review can lead the practitioner to relevant studies that pursued the same research purpose and can thus inspire/guide the researchers in the development of their approach. We summarize the findings of our review in the decision tree representing the various possible approaches and methods (cf. Figure 13).

- If the purpose is to identify variables composing impact pathways (1<sup>st</sup> path), the means used could be: existing empirical researches, including in social sciences, specific theoretical approach, expert or stakeholder consultation;
- If the purpose is to investigate pathways (2<sup>nd</sup> path): the approach used could be a method to infer causality (e.g. SEM), to quantify a correlation (e.g. simple and multiple regression), or another more qualitative approach. If the purpose is to apply impact pathways, characterization factors, or to measure midpoint or endpoint impact indicators (3<sup>rd</sup> path): the two linked phenomena and the way that data or result is obtained could more clearly be specified. For the latter, it can be through a calculation and the application of an existing characterization factor or through a simple measurement of observed data (statistics or on-site collection). In that former case, the specification of the origin of the characterization factor should be required in any S-LCA study, in order to ensure transparency.

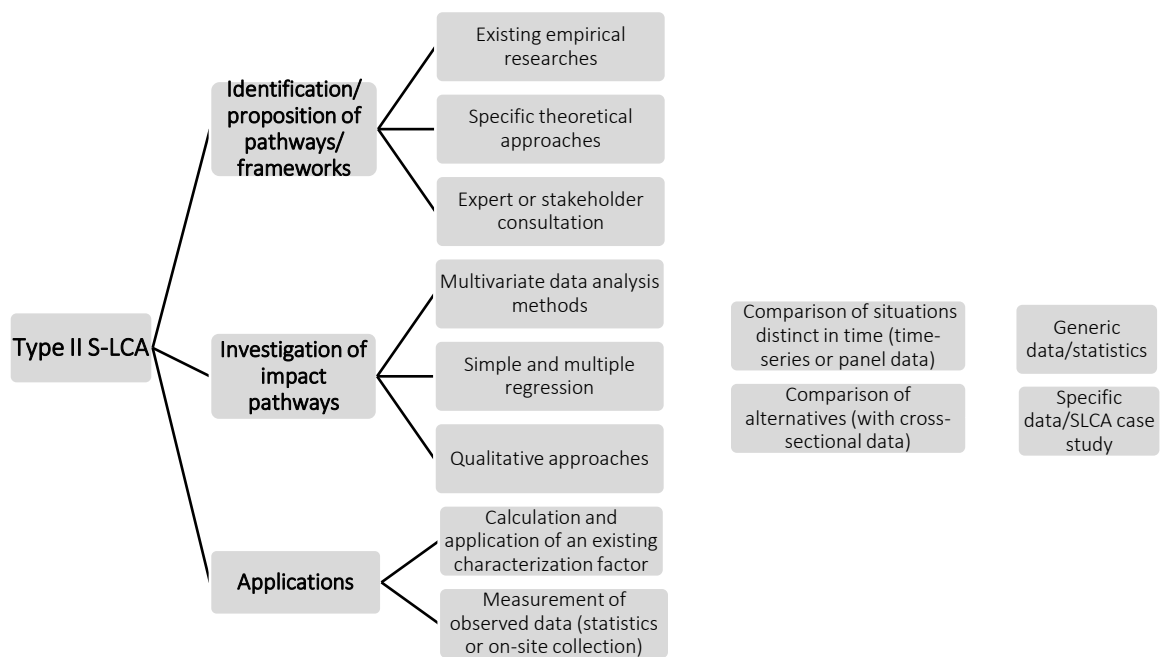


Figure 13: Decision tree for S-LCA type II research

### For future Type II research

**Using existing theoretical frameworks to identify pathways.** We have seen that several ways are used to identify impact pathways or general frameworks for S-LCA (expert and stakeholder consultation, existing scientific knowledge). To identify impact pathways, we recommend **using existing theoretical frameworks**, including in social sciences (e.g. economics, sociology, management studies, development studies), which are themselves drawn from empirical observations. This recommendation is in accordance with previous calls to draw on existing researches in social sciences (Grubert 2016; Arvidsson, Baumann, and Hildenbrand 2014; Iofrida et al. 2016) and to reinforce theoretical grounds for S-LCA, especially when it comes to impact pathways (Jørgensen, Lai, and Hauschild 2009; Feschet 2014; Iofrida et al. 2016). To select impact pathways we argue more precisely to use theories that seek to explain or understand phenomena relevant for S-LCA (e.g. health impacts of workers and users, poor employment and working conditions, or inequalities within supply chains).

**Using multivariate data analysis methods to investigate impact pathways** (Bonacina De Auraujo and Ugaya 2018; Neugebauer 2016; S. R. Wu et al. 2015). If identified impact pathways have been investigated enough, validated or even quantified, these can be directly integrated in S-LCA case studies (as 3.1 approaches do). Otherwise, identified impact pathways might be empirically investigated and/or tested, before being integrated in SLCA case studies. The investigation of impact pathways has been done mostly with econometric modelling, and simple and multiple regression through the search for correlation between two indicators (e.g. Bocoum et al., 2015; Feschet et al., 2012; Norris, 2006) (Neugebauer 2016). In the same vein, (S. R. Wu et al. 2015) used structural equation modelling in order to infer causality. We support the call of (Bonacina De Auraujo and Ugaya 2018) to expand this by existing **multivariate data analysis methods** in order to identify latent variables in impact pathways (e.g. principle component analysis, exploratory factor analysis), or even in order to confirm these latent variables (incl. with structural equations modelling).

While these studies look at the co-variations of two or more indicators during a time period, another and less used way to investigate causality is **to look for variations of indicators among individuals** as done

by (Hofstetter and Norris 2003) (cf. Supplementary material 2). It appears that it would be worth using this latter approach also in order to investigate impact pathways.

**Using S-LCA to build knowledge on cause-effect chains relating to product life cycles.** These studies using statistical methods are implemented with generic data, often at macro level. Possibly, the investigation of impact pathways could also be done through **the carrying out of a S-LCA case study based on specific data, collected on-site** (cf. Figure 13). This would then suppose that all investigated variables be observable, and would thus exclude certain non-observable variables on e.g. health impacts which are rarely observable at the time that the study is carried out. But a number of variables and impact pathways could be investigated this way.

Obviously, when using specific data (and thus small samples) it is not possible to call upon statistical methods to investigate impact pathways. Other methods in social sciences to analyze cause-effect chains might be usefully explored and potentially imported into S-LCA methodological development works, e.g. **more qualitative methods such as mechanism analysis/identification** (Knight and Winship 2013; Gorton 2019).

Impact pathways may be investigated with smaller sample of specific data, but those should then be applied to other cases in order to check their general applicability. The approach envisaged in (Sureau and Achten 2018 or chapter 4 and 5) corresponds to the investigation of an impact pathway through the carrying out of a S-LCA case study using specific data and comparing various alternatives for the same product (cf. Figure 13). These alternatives are chosen on the basis of their differences, corresponding to parameters which are set as explanatory variables of other impacts variables. The objective of (Sureau and Achten 2018, or chapter 4 and 5) is to analyze the causality between product chain governance models, transaction modalities, value chain actors profitability and provided employment conditions. Such approach could be used to analyze other causal relations (e.g. working conditions and worker wellbeing). **In this way, S-LCA can be used as an empirical tool to build knowledge on cause-effect chains relating to product life cycle.**

**Looking at the root causes of main social issues.** The discussion above brings us to the key issue of what is to be assessed. When looking at impact pathways included in current Type II approaches investigating (2) and applying pathways (3), we can conclude that these are limited to E-LCI, income and health variables, i.e. mainly quantitative variables, for which there is an easy access to data at macro level for the latter ones (one notable exception is the recent study of (Iofrida et al. 2019) linking exposure to certain working conditions and health impacts). This is however not the case of approaches identifying impact pathways (1), which include much more diverse variables that get close to what is being assessed in Type I S-LCA. Together with the use of more qualitative approaches to investigate impact pathways (cf. recommendations), other impact pathways and **qualitative variables** relevant to S-LCA (e.g. including the issue of employment and working conditions in the supply chain) could be addressed. The approaches using quantitative models and variables has clear advantages and merits, and also deserve further research. However, we consider that we should not limit ourselves to quantitative models and variables, because such a limitation will necessarily hamper the coverage and potential comprehensiveness of S-LCA. We argue that S-LCA should not be adapted to fit the E-LCA format, but S-LCA should be tailored to explain social mechanisms by considering the (social) nature of assessed impacts or phenomena, implying other variables and methods.

Such a shift to other variables and impact pathways could be a way to align Type I and Type II S-LCA. In fact, putting in perspective Type II studies with what is done in Type I S-LCA, we observe few connections between these two fields in terms of assessed aspects or variables. Type I studies focus mainly on employment and working conditions in supply chains, highlighting the presence of “hotspots” or unfavorable practices of suppliers regarding workers, in the context of contemporary global value chains. While S-LCA is developed with the aim to improve social impacts linked to product life cycles, few Type II studies focus on the investigation of sources or causes of main social issues, such as poor employment and working conditions on supplier side. Indeed, current approaches focus on the downstream side of impact pathways (assessing health impacts of certain working conditions or income), rather than **the upstream side of impact pathways (looking for the root causes of indecent employment and working conditions or income)**. Thus, we see a need to investigate impact pathways linking main problems in product life cycles. We foresee interesting areas of potential research investigating the root causes of inequalities within product chains, and of poor employment and working conditions at level of suppliers or upstream nodes of value chains, which are the main hotspots highlighted in type I S-LCA studies. Such research could help identify levers that could be activated to improve the social sustainability of product chains.

## **Supplementary material 2: Description and characterization of Type II approaches**

*Description and characterization of Type II approaches - First path: Identification/proposition of pathways or frameworks*

Title of study and author(s)	Purpose of the study and details of the method	Start of impact pathway	End of impact pathway
<b>(1.1) REVIEW OF INDICATORS used in S-LCA through literature review in the light of impact pathways</b>			
Assessing the validity of impact pathways for child labour [...] (Jørgensen et al. 2009)	Through a review of literature of relevant research fields, investigation/discussion over the validity of an inventory indicator usually used in S-LCA.	Incidence of child labour	Various, incl. health risks, schooling outcomes, wage
On the scientific justification of the use of working hours, child labour and property rights [...] (Arvidsson et al. 2014)	Through a literature review of non-S-LCA scientific articles, investigation of the scientific justification of the use of topics usually included in S-LCA. For each of the analysed topic, impacts were identified and classified according to whether the topics facilitated or obstructed beneficial social values/impacts, and whether they facilitated or obstructed adverse social values/impacts	Working hours, child labour and property rights	Various
<b>(1.2) IDENTIFICATION/BUILDING OF SPECIFIC IMPACT PATHWAYS on the basis of existing research, theoretical approaches or external sources (consultation of stakeholders or experts)</b>			
Defining the baseline in social life cycle assessment (Jørgensen et al. 2010)	On the basis of the statement that the “consequence of a decision to implement a life cycle of a product can be seen as the difference between the decision being implemented and ‘non-implemented’ product life cycle”, identification of impacts relating to the non-implemented product life cycle on the basis of theories and empirical findings from relevant fields of research, and proposition of indicators. For workers, the study looks at impacts of unemployment and four impact categories are proposed, in addition to “modifying factors” (factors that influence the impacts).	Unemployment	Physical health and mental health, poverty, family tension, violence and crime
Anticipating Psychosocial Factors Effects in the agri-food sector: the Siegrist’s Pathway (Silveri 2016)	Silveri bases her work on the Job demands/resources model (Demerouti et al. 2001, 2004 in (Silveri 2016)) in order to build a pathway linking working conditions and well-being at work (Siegrist pathway). The task is to identify most relevant job resources and demands that influence well-being at work. Variables and relations between them are identified through literature review and with the use of data from two sites of a French company bottling and selling wine (company social documents and interviews with workers). Next to that work, data were collected through a literature review to build a matrix relating factors “to the probability of a specific disease to occur”. This pathway is called the Matrix pathway (Macombe 2013b) in which all known results (qualitative and quantitative) for interesting relations are gathered from existing studies.	Job resources and demands (including psychosocial risk factors)	Risk of occupational health
Necessity of including the evaluation of pesticides impacts on farmworkers health in social LCA (Di Cesare, Macombe, et al. 2016)	In order to build the impact pathway linking pesticides exposure with health impacts on farm workers (Wesseling pathway), Di Cesare et al. use expert knowledge with expert elicitation/Delphi expert consensus method and interviews (systematic approach that synthesize subjective judgments of experts about one issue). From interviews, knowledge trees are designed. Then “human cost” equations are designed, with the use of this expert knowledge, especially on the degree of operators’ exposure. The model can be used to compare different cropping systems for the same crop.	Pesticides exposure way	Health impacts on farm workers
Including chain governance and economic aspects to assess and explain social impacts [...] (Sureau and Achten 2018)	Proposition of an impact pathway linking product chain governance, inequalities within the product chain and working conditions on the basis of the theoretical approach of value chain and global supply chain analysis. The latter analyze the way that product chains are organized and governed and the power relations embedded in supply chains, which potentially explain inequalities within supply chains. Impact pathway to be investigated by comparing employment and working conditions in chains differing in terms of governance.	Chain governance and transaction modalities between VCA	Profitability, employment and working conditions



Title of study and author(s)	Purpose of the study and details of the method	Start of impact pathway	End of impact pathway
<b>(1.3) DEVELOPMENT OF THEORETICAL FRAMEWORKS including several pathways/midpoint and endpoint categories</b>			
The Integration of Economic and Social Aspects in Life Cycle Impact Assessment (Weidema 2006)	Development of a framework including six damage categories that are to be aggregated to a comprehensive indicator (Quality Adjusted Life Years) and a set of inventory indicators. Provision of examples of impact pathways linking inventory indicators to impacts on wellbeing and productivity: child labour and autonomy infringement and productivity (through lack of education), health impacts of unemployment, etc. In addition, an estimate of global normalization values is proposed.	14 quantitative social pressure inventory indicators measuring midpoint impacts	Damages incl. life and longevity, health, autonomy, safety, security and tranquility, equal opportunities, participation and influence, to be translated in QALY
Social Indicators for Sustainable Project and Technology Life Cycle Management in the Process Industry (Brent and Labuschagne 2006)	Proposition of a theoretical framework to assess social sustainability of projects and technologies and of a quantitative method to calculate impacts. The framework includes four AOP) linked to 18 midpoint categories and to interventions of life cycle system. The method was then applied to projects and technologies in three process industries: an open cast mine, a chemical facility and a fibre manufacturing plant but not completely given the lack of data for each midpoint category.	Various	Internal human resources, external population, macro social performance and stakeholder participation
A Framework for Social Life Cycle Impact Assessment (Dreyer et al. 2005)	Proposition of a theoretical framework to conduct S-LCA. Dreyer proposes Human dignity and well-being as AoPs and a two-layer set of impact categories: an obligatory, normative, predetermined set of categories expressing minimum expectations to conducting responsible business (based on UN conventions and on local and national norms), and an optional, self-determined set of categories expressing interests specific to the product manufacturer. According to this framework, "Impacts on people are naturally related to the conduct of the companies engaged in the life cycle rather than to the individual industrial processes."	Conduct of companies	Two layer set of impact categories with obligatory and optional categories, under two AOPs
Impact Pathways to Address Social Well-Being and Social Justice in S-LCA—Fair Wage and Level of Education (Neugebauer, Traverso, et al. 2014) and Calculation of Fair wage potentials along products' life cycle – Introduction of a new midpoint impact category for social life cycle assessment (Neugebauer et al. 2016)	Development of qualitative pathways from life cycle inventory to endpoint impacts for two midpoint categories: <b>(1)</b> level of education and <b>(2)</b> fair wage. Definition of inventory indicators, of areas of protection (social well-being and social justice) and of three endpoint (economic welfare, environmental stability and damage to human health), that are to be linked to midpoint impacts. For the latter midpoint category (2), in a further article, proposition of a quantitative indicator "fair wage potential": real wage and working time are compared to minimum living wage and contracted working time. In addition, an inequality factor describing income inequalities at organizational, sectoral or country levels (according to data availability) is included. This approach is "comparable to the classical distance-to-target method that sets "the actual state in relation with the targeted situation" which is expressed by the characterization factor defined, thus this approach gets close to the Type I approach comparing life cycle inventory data with a performance reference point. Database to calculate the indicator and linkages with endpoints proposed. Model applied on case study on tomatoes produced in Germany.	<b>(1)</b> Indicators on education and discrimination	Type of jobs, working conditions, public and private education and information access as direct impacts, to be linked to level of education
		<b>(2)</b> Indicators on income, other benefits for employees and worker expenses	Access to needs as direct impacts to be linked to fair wage
Towards a taxonomy for social impact pathway indicators (Weidema 2018b)	Development of a conceptually complete taxonomy for social impact pathway indicators, with elementary flows, midpoint impacts and endpoint impacts. Basis for this taxonomy includes Joliet et al. (2009) for areas of protection, Simões (2014) for elementary flows, Bare et Gloria (2008) and UNECE (2014) (as cited in (Weidema 2018)).	Various	Equity-weighted welfare or utility

*Description and characterization of Type II approaches – second path: investigation of impact pathways*

Title of study and author(s)	Purpose of the study and details of the method	Start of impact pathway	End of impact pathway
<b>(2.1) INVESTIGATION OF IMPACT PATHWAYS by searching for correlations with simple and multiple regression</b>			
Social Impacts in Product Life Cycles – Towards Life Cycle Attribute Assessment (Norris 2006)	Reconstruction of the relation between economic activity and health with the support of World Bank data from 2002 and calculation of country-specific characterization factors. Norris applied these factors to calculate the impact on life expectancy of an increased economic activity in the (global) supply chain of Dutch electricity (with the help of a multiregional input/output LCI database) and to compare it to the impact of related pollution. He finds that “economic growth is much more powerful at achieving health benefits when it occurs in the lower-income countries”. In the discussion part, Norris questions this approach given its limitations, including the uncertainties relating to the use of national-average impacts.	Incomes related to economic activity and pollution	Life expectancy
An exploration of measures of social sustainability and their application to [...] (Hutchins and Sutherland 2008)	Use of the “UN’s Human Development Report of 2005 to establish a non-linear regression model to describe the impact pathway from the GDP per capita in the purchasing power parity (PPP) to the infant mortality rate” (Wu, 2014). The model is then applied to a case where a company has to choose between two suppliers, in the US and in Mexico.	GDP per capita in PPA	child mortality rate
Social impact assessment in LCA using the Preston pathway (Feschet et al. 2012)	Calculation of the Preston pathway linking GDP per capita with life expectancy based on panel data from 107 countries, from [1950-2009] and definition of its conditions for use. Feschet et al. then apply the pathway to the bananas industry in Cameroon to calculate the health impacts resulting from the export of 200.000 tons of bananas annually over the 2010-2030 period.	GDP per capita	Life expectancy
Anticipating impacts on health based on changes in income inequality caused by life cycles (Bocoum, Macombe, and Revéret 2015)	Calculation of the relationship between income inequality and infant mortality (Wilkinson pathway) in member and non-member OECD countries with an empirical regression model based on the generalized method of moments (GMM). Data includes 46 countries over the period 1960-2006, that come from various sources. Then, Bocoum et al. propose “a method to calculate the change in income distribution in a population (hence the variation in the Gini coefficient) based on changes in the life cycle (expressed in variation in turnover)” and present a fictional case study.	Change in income distribution (GINI)	infant mortality rate
<b>(2.2) INVESTIGATION OF IMPACT PATHWAYS by searching for causal inference between variables</b>			
Causality in social life cycle impact assessment (SLCIA) (Wu et al. 2015)	Development of an approach to identify impact pathways with multiple impact categories simultaneously and intermediary variables for Type II characterization models through SEM (Structural equations modelling). Quantification of an example impact pathway at macro-scale.	GDP per capita, through health expenditures and access	Life expectancy
<b>(2.3) INVESTIGATION OF IMPACT PATHWAYS through the comparison of alternatives</b>			
Why and How Should We Assess Occupational Health Impacts in Integrated Product Policy? (Hofstetter and Norris 2003)	Investigation of the pathway linking working conditions per sector and health impacts. Comparison of two alternatives to produce fuel tank systems for cars (plastic or steel) in terms of number of death of workers, on the basis of information on occupational injuries and illnesses provided by companies to the U.S. Bureau of Labor Statistics. “Because of data uncertainties, they could not establish a pathway differences in worker health according to sectors” (Feschet 2014).	Sectors	Human health with the number of death

*Description and characterization of Type II approaches – third path: applications*

Title of study and author(s)	Purpose of the study and details of the method	Start of impact pathway	End of impact pathway
<b>3.1 APPLICATIONS of existing and already quantified impact pathways</b>			
<b>E-LCI and/or exposure to substances =&gt; health impacts on society and/or on users (health impacts related and/or not related to environmental impacts)</b>			
[...] LCSA of municipal solid waste management systems [...] (Menikpura et al. 2012)	Assessment of impacts from municipal solid waste management in Thailand: income-based community well-being <b>(2)</b> and <b>(1)</b> societal health impacts linked to environmental issues with "relevant characterization factors for mortality, severe morbidity and morbidity, that were retrieved from the [Swedish environmental priority strategies] model [Steen, 2000]".	<b>(1)</b> E-LCI	Disability-adjusted life years (DALY)
Does the Production of an Airbag Injure more People than the Airbag Saves in Traffic? (Baumann et al. 2013)	Comparison of lives saved by the use of airbags <b>(3)</b> with DALY lost due to airbag production, incl. 4 process areas: human toxicity along the life cycle, excl. waste handling <b>(1)</b> , accidents during the mining of metals, the production of electricity and of inflators <b>(2)</b> . <b>(1)</b> DALY lost due to toxic emissions (metals, organic pollutants and air pollutants), along the airbag life cycle calculated using the Uniform System for the Evaluation of Substances Adapted for LCA Purposes (USES-LCA) model used in the Eco-indicator '99 method. It does not include health damages due to emissions to the environment.	<b>(1)</b> Human toxicity emissions	DALY
A method for human health impact assessment in social LCA: lessons from three case studies (Arvidsson et al. 2016)	Comparison of health impacts of production of catalytic converters and gold jewellery (human toxicity impacts and health impacts stemming from emissions contributing to environmental problems <b>(1)</b> , work environment impacts for all processes <b>(2)</b> ) and for the latter only, the lives saved by their use (conflict-related DALY <b>(3)</b> ). <b>(1)</b> For both products: health damages due to emissions to the environment and human toxicity impacts with ReCiPe method. For 1 <sup>st</sup> product only: DALY avoided in use phase similarly quantified by assessing avoided health impacts from the reduced emissions.	<b>(1)</b> E-LCI + human toxicity emissions	DALY
Implementation of socioeconomic criteria in a Life cycle sustainability assessment framework applied to housing retrofitting [...] (Touceda, Neila, and Degrez 2016)	Definition of models to assess social and socioeconomic impacts of two housing retrofitting options. In addition to health impacts stemming from emissions to the environment <b>(1)</b> , health impacts for households stemming from indoor air quality <b>(2)</b> and from inadequate indoor temperature and mold <b>(3)</b> (see below). Other assessed impacts include: damages to workers <b>(4)</b> , fair employment, fuel poverty of households, and contribution to growth <b>(5)</b> (see 3.2). <b>(1)</b> Health damages due to emissions to the environment with the RECIPE method (outdoor air quality)	<b>(1)</b> E-LCI	DALY
	<b>(2)</b> Health impacts for households of retrofitting options assessed, including direct impacts of substances (NO <sub>2</sub> , VOC, Formald; PM <sub>10</sub> and PM <sub>2.5</sub> ) with the USETOX method (indoor air quality)	<b>(2)</b> Human toxicity emissions	DALY
<b>Exposure to certain use conditions =&gt; health impacts on users</b>			
(Touceda et al, 2016) See study detail above	<b>(3)</b> Health impacts of specific retrofitting options regarding inadequate housing: impact of insulation and ventilation on the presence of mold and on indoor cold, which in turn influence respectively asthma and cardiovascular diseases.	<b>(3)</b> Exposure to indoor cold and mold	Relative risk of cardiovascular diseases and asthma in DALY
<b>Exposure to certain working conditions =&gt; health impacts</b>			
Psychosocial risk factors' impact pathway for S-LCA : an application to citrus life cycles in South Italy (Iofrida et al. 2019)	Building the work of (Silveri 2016) on the psychosocial risk factor's impact pathway, calculation of risk to develop health troubles stemming from the working conditions (i.e. psychosocial risk factors) of the cultivation of two citrus (orange and mandarin). As a first step, the number of hours of working exposed to specific working conditions (e.g. vibration, stress, cold temperatures, high physical demand, use of chemicals, temporary employment etc.). Then, these hours are translated into risks of developing certain diseases (physical and psychological), with the support of odds ratios (i.e. statistical measure of the intensity of the association between two variables) that were retrieved from previously published empirical studies in medical sciences.	Exposure to certain working conditions	Relative risk to develop certain health troubles

Title of study and author(s)	Purpose of the study and details of the method	Start of impact pathway	End of impact pathway
<b>(3.2) APPLICATIONS of characterization factors</b>			
<b>Income =&gt; access to basic needs or utility</b>			
Societal LCA Methodology and Case Study (David Hunkeler 2006b)	Measurement of the working hours necessary for each unit process of the product life cycle and of their geographical localization. These hours act as an activity variable, which is linked to the functional unit. Alongside, a characterization table is built which determines the number of working hours necessary to access a serie of needs (housing, health care or education) in each country. From the working hours calculated for each unit process, calculation of the increased access to housing, education and health care generated through employment. Application of the method to a case study of 2 detergents; the one which uses more working hours in countries where e.g. housing is more affordable will generate more benefits in terms of access to housing.	Working hours/employment and generated income	Access to social needs, considering specific national cost of living
(Menikpura, Gheewala, and Bonnet 2012), see study details above	<b>(2)</b> Use of Hunkeler approach to calculate the uplifting living standard resulting from employment and income, considering the cost of living in the country where income is generated. Application to municipal solid waste management systems in Thailand.	(2) Employment and income generation from indirect activities	Income-based community well-being considering cost of living
Quantification of social equity in LCA for increased sustainable production of sanitary products in Uganda (Musaazi et al. 2015)	Based on the principle of the economic multiplier effect, comparative analysis of the social equitability of a product according to where it is produced and consumed (Uganda/OECD country), through two impacts, “quantified as a function of income level”: <b>(1)</b> Affordability: cost of sanitary pads as a % of annual income, multiplied by an estimated world income distribution function; <b>(2)</b> Manufacturing wage impacts: difference in a specific manufacturing plants’ laborers’ wages minus income, multiplied by the distribution function. Due to countries’ income differences, impacts of producing pads in Uganda is greater than importing pads.	(1) Costs of products as a % of annual income	Affordability impacts
		(2) Wages	Manufacturing wage impact
The social footprint—a practical approach to comprehensive and consistent social LCA (Weidema 2018a)	Combination of a top-down approach using input-output data to focus the data collection effort on processes with high value added or number of work hours, with an impact assessment that limits the inventory data requirement and the need for detailed impact pathway descriptions, by focusing on: impacts <b>(1)</b> of income redistribution on utility and <b>(2)</b> of missing governance on productivity. Application to Nestlé’s milk production in Pakistan, to tomato sauce production in Spain and to clothing industry. <b>(1)</b> For the 1st pathway, the idea behind is that productive activities imply an income transfer between e.g. workers, consumers. The distributional impact is calculated as the increase/loss in utility caused by the transfer, by weighting the spending and income for each group by their relative marginal utility of income (with related elasticity) and by applying a purchase-power correction.	<b>(1)</b> Added value distribution by country-sector	Increase (or loss) in utility
<b>Various factors =&gt; productivity</b>			
(Weidema 2018a), see study details above	<b>(2)</b> Productivity impacts of missing governance is viewed as an “overall summary measure” incl.: missing education, corruption, underemployment, trade barriers and lacking physical infrastructure, with no details on the specific causal factors. “Additional data sources are [...] required to disaggregate the summary indicator according to these causal factors.” Productivity impact measured by the difference between the actual and potential value added when all productivity impacts are internalized (corresponding to the value added per work hour in the US, corrected with a coefficient to consider impacts from e.g. unemployment).	<b>(2)</b> Missing governance	Productivity impact

Title of study and author(s)	Purpose of the study and details of the method	Start of impact pathway	End of impact pathway
<b>(3.3) APPLICATIONS through the measurement of midpoint and endpoint impact-based indicators, without the use of impact pathways</b>			
<b>Measurement of health indicators (work environment and users)</b>			
(Baumann et al. 2013) See study detail above	(2) The DALY lost due to metals mining and the production of electricity and pyrotechnic materials were estimated using their statistical records on accidents.		Number of fatal accidents and diseases in DALY
	(3) DALY saved by their use was estimated with the support of statistics provided by the producing company.		Lives saved by the product use in DALY
(Arvidsson et al. 2016) See study detail above	(2) For catalytic converter and gold jewellery: work environment impacts for all processes based on work of Scanlon et al. (2015), which developed industry-level work environment characterization factors, incl. both injuries (e.g. bruises, wounds and traumatic injuries) and workplace exposure to chemicals. These factors are ratios of work-related fatal and nonfatal injuries and illnesses occurring in the U.S. worker population to the amount of physical output from U.S. industries.		Number of fatal accidents and diseases in DALY
	(3) For gold jewellery only: the conflict-related DALY caused by gold estimated as work environment health impacts: number of DALY calculated by dividing the DALY caused in the conflict with gold production from 1998 to 2006 and allocated to gold by economic value".		Number of deaths linked to conflicts
(Touceda, Neila, and Degrez 2016), see study detail above	(4) Work environment health impacts assessed based on the number of fatal, non-fatal and occupational diseases in the supply chain from local statistics (as the total number of hours worked per profession) and translated into DALY with the use of the WHO Global burden of disease method: calculations of YLL and YLD from the number of fatal accidents and diseases. For background processes: SHDB		Number of fatal, non-fatal accidents and occupational diseases in DALY
<b>Calculation of other simple indicators</b>			
Designing the social life cycle of products [...] (Lagarde and Macombe 2012)	Presentation of the systematic competitive model which aims at setting system boundaries and includes the short term effects of competition with the planned activities. Application to a case study assessing rural job creation/destruction effects of a plan of the government of Croatia to install industrial pig production farms. Assessment of the effects on an event that is external to the product life cycle on demand and then on employment creation/destruction		Employment creation/ destruction
<b>Measurement of other composite indicators</b>			
(Touceda, Neila, and Degrez 2016) See study details above	(5) Socioeconomic impacts for workers: indicator "fair employment", combining "the quantification of worker hours and their qualification in relation to the associated risks, which are assessed through a combination of SHDB indicators (e.g. wage, child labor)		(5) Fair employment
	(5) Socioeconomic impacts on households: indicator "fuel poverty", measuring "the amounts by which the assessed energy needs of fuel poor households exceed the reasonable cost threshold". Data: various costs at household level and household disposable income.		(5) Fuel poverty
	(5) At the state level, calculation of "Net present cost": it sums up public investment, return and avoided expenses (cost of works and rehousing costs for social housing, loss and gain of VAT, contribution to social security and avoided aids to unemployment)		(5) Net present cost



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## CHAPTER 3: What do S-LCA produce as results and how can those be used?

### A review of S-LCA studies in the food sector

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After the focus of the first and second chapters on methodological issues relating to the ‘what’ and the ‘how’, we propose in this chapter to look at the results of S-LCA studies and to analyze their usability. Concretely, we look at the actual and concrete results brought by S-LCA case studies in the particularly sensitive sector of food, at the empirical learnings that are made and at how those can be used.

#### 1. Introduction

##### *1.1 A review of studies in the food sector*

We chose to focus on the food sector because it echoes with many social and socioeconomic issues, relating to consumers (through the basic need that food satisfies and the relating health issues), local communities (given the externalities created by farming activities, spread over territories – more than 1/3 of land being devoted to farming worldwide) and workers. Agriculture provides jobs and livelihood to 28% of the labor force worldwide, yet with rather poor employment and working conditions (World Bank n.d.).

In Asian and Pacific countries, even 35% of the workforce is in farming and 42% in Sub-Saharan Africa (FAO 2017). Agriculture is one of the most hazardous sectors, with construction and mining (ILO 2009; n.d.). Non-standard, vulnerable and informal employment are mostly found in this sector, given seasonal fluctuations in workforce needs, or the volatility of commodity prices (ILO 2016; 2018). In developing countries, the sector entails major problems, including “the largely unrecognized role of women in agriculture, exclusion of agricultural workers from national labor laws, low wages, dangerous working conditions, and a high incidence of child and forced labor” (ILO n.d.).

#### **Farming: a sector with high social risks for farms and their workers, also in Northern countries**

##### **A changing industry, declining in terms of employment**

In Northern countries, the agricultural labor force is much smaller (around 5%), and it continues declining: in the EU15, there has been a sharp decline of 22 % in the total labor force employed in the sector between 2000 and 2012 (Bourgeois 2013). Most of this decline regards non-salaried workers, i.e. farms holders and their family members (EC 2013), what should be read in conjunction with the decline in the number of farms, the expansion in their herd and land area size and to the growing use of mechanization, (Schuh 2019, 18) describing the situation as “a concentration of EU agricultural activity in a decreasing number of larger capital-intensive farms”. In addition to the implications in terms of employment, this trend “has affected labour and generational renewal by both making new entry into farming costly and making it difficult for small scale farms, and family-based farms to compete [...]” (Schuh 2019, 94).

##### **An income divide between small and large farms**

Those small-scale and mixed farms face income issues, in contrast with big farms, which have the highest incomes (particularly cereals). Overall, between farms, there are big inequalities in terms of income, with 20% of the labor force generating 78% of the family farm income in the EU and a substantial percentage of farmers are poor workers (Hill and Bradley 2015). Exact figures are rare, but in the beginning of the 2000s, 31% of Belgian farm households earned less than the poverty threshold of

€20,000 (Meert et al. 2005). In France, recent figures show that 30% of French farmers earned in 2015 less than €354 a month from the farming activity (Trecolle and Banet 2019). In order to address this income issue, an increasing number of farmers diversify their activities on the farm (processing and/or selling of agricultural products in short food supply chains, agritourism and renewable energy production) and one third has another gainful professional activity besides production to complement their incomes (Hill and Bradley 2015; Schuh 2019).

### **Poor employment conditions**

In farming, stable and fixed contracts are less prevalent. Most work being done by farmers and their family members (92 %, the resting 8 % being done by hired workers), the average rate of self-employed is much higher than in other sector (more than half of the workers, compared to 15% on average) (Schuh 2019; Eurofound 2014a). The use of employees varies according to EU countries, “many parts of Europe predominantly feature[ing] family farming models [...], while other regions demonstrat[ing] a majority of externally hired labor (the belt ranging from Eastern-Germany to Slovakia over Czechia, the majority of France and Southern Spain)” (Schuh 2019, 9).

For farm workers, agriculture stands as a sector with a particularly high share of employees without indefinite contracts: they are 40%, against 20% for the overall economy. Within those 40%, 15 % have fixed-term contracts, 12.5% do not have contracts (against 4.7% overall) and around 10 % have other forms of contracts such as temporary agency work or daily contracts (against around 3% overall) (Eurofound 2014b). Those other forms which are non-standard, in addition to be fixed- and short-term, do not provide the benefits that salaried employees have access to: wages are low and the access to social security is almost non-existent (see also Introduction, 1.2.2). In Belgium daily contracts have been created especially for the harvest, with a lot of flexibility for the employers and low labour costs<sup>32</sup> and in Wallonia, around 35% of workers of vegetable farms would be employed under seasonal contracts like those. And only around 30% would work under regular employee contracts providing full social benefits (indefinite or fixed-term employee contracts) (Dumont 2017, 165).

### **Especially for (migrant) seasonal workers**

The reliance on temporary labor is found in Mediterranean countries (Spain, Italy, France), and in Flanders, the Netherlands and Western Germany (Schuh 2019). Also, while the share of foreign workers in the EU agricultural sector remains low (1.6% of workers from other EU Member States and 2.7% of workers from third countries), the use of migrants in farms is developing: “In some countries (e.g. Italy, France, Spain), foreign workers are now forming part of the agricultural sector’ structure” (Schuh 2019, 96) and “the share of international migrants in the farm workforce is rising in most industrial countries and in many middle-income developing countries, while internal migration to fill seasonal farm jobs is declining” (Martin 2016, ix). Some of those migrants are employed in livestock farms with mega-animals operations but they are mainly involved in the harvest work on farms that produce fruit, vegetable and horticulture commodities.

While those jobs provides income-earning opportunities for migrants, many abuses are reported including too little work (because workers are employed through third party contractors that recruit too many workers to avoid labor shortages), underpayment, unpaid days off, and lack of worker protection. Also, “migrant workers often have high injury and illness rates due to carrying and lifting, often over uneven ground, and the risks posed by pesticides and other chemicals. Relatively few farm workers are

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<sup>32</sup> Called the ‘Carte cueillette’ or ‘Plukkaart’



represented by trade unions, and governments often have difficulty enforcing labor and health and safety laws in agriculture because few workers complain of violations” (Martin 2016, x).

In Spain for example, “most of the farms producing labor-intensive commodities in Almeria rely on a mix of legal and unauthorized migrants to perform labor-intensive tasks”, coming mainly from Eastern Europe, Morocco and Ecuador (Martin 2016, 26). In the Italian region of Campania, migrant are often employed through the use of illegal intermediaries named ‘caporalato’: “this is often linked to gang-masters and results in exploitation of human beings and human rights violations, even when migrants are regularly employed.” (Schuh 2019, 75). In Belgium, there has been since 2005 a huge influx of seasonal workers from new EU member states (particularly Poland) to work in agriculture, especially in the Flemish fruit sector (Rosenfeld, Marcelle, and Rea 2010). Before employed mainly with work permits, they now mainly work as posted workers and were around 23 000 workers from Central and Eastern Europe in 2014, for a total of 45 000 seasonal workers, to be employed mainly in Flanders. Their situation does not seem to be comparable to that of migrant workers in Italy or Spain, however, some issues are reported, including cases of underpayment and fraud, and they are employed under daily contracts (Vallet 2014; Rosenfeld, Marcelle, and Rea 2010).

#### **And overall hard working conditions**

In addition, the number of work hours per farmer is high: in France, farmers work 15% more than a craftsperson, and 35% more than an employee (INSEE 2014). At the EU level, the sector “stands out as having the highest proportion of workers performing an excessive number of working hours” (ILO 2018).

And finally “the sector has a high proportion of absenteeism due to work accidents, with relatively many workers reporting poor health and their health to be at risk because of work” (Eurofound 2014a). In France, farmers and farm workers have 12 % more probability to commit suicide, with almost one suicide daily, echoing the high rates prevailing in the US or in India (L’Obs 2019; Weingarten 2018).

Those specific issues in the agricultural sector occur within chains characterized by a particular governance, as depicted below.

#### **Food chains: highly concentrated chains**

In addition to the specificities that are inherent to primary products (located at the upstream level of product chains) and to an activity reliant on land, weather and seasons, the agricultural sector relies on chains whose current governance is seen as problematic (Mooney 2017). As summarized in a briefing note from the former UN special rapporteur on the right to food Olivier De Schutter:

*“Disproportionate buyer power, which arises from excessive buyer concentration in food supply chains (among commodity buyers, food processors and retailers), tends to depress prices that food producers at the bottom of those chains receive for their produce. This in turn means lower incomes for these producers, which may have an impact on their ability to invest for the future and climb up the value chain, and it may lead them to lower wages that they pay the workers that they employ. There is thus a direct link between the ability of competition regimes to address abuses of buyer power in supply chains, and the enjoyment of the right to adequate food” (De Schutter 2010, 1).*

While this concentration level at the rather downstream level of chains is not specific to food chains (cf. 1.2.3 of the introduction), it is particularly high in those chains and poses particular problems given that, at the other end of chains, production is carried out by a very high number of small-scale suppliers, this strengthening the imbalance within the chain. In addition, concentration occurs at the level of input provider as well, this squeezing farmers even more (cf. Figure 14).

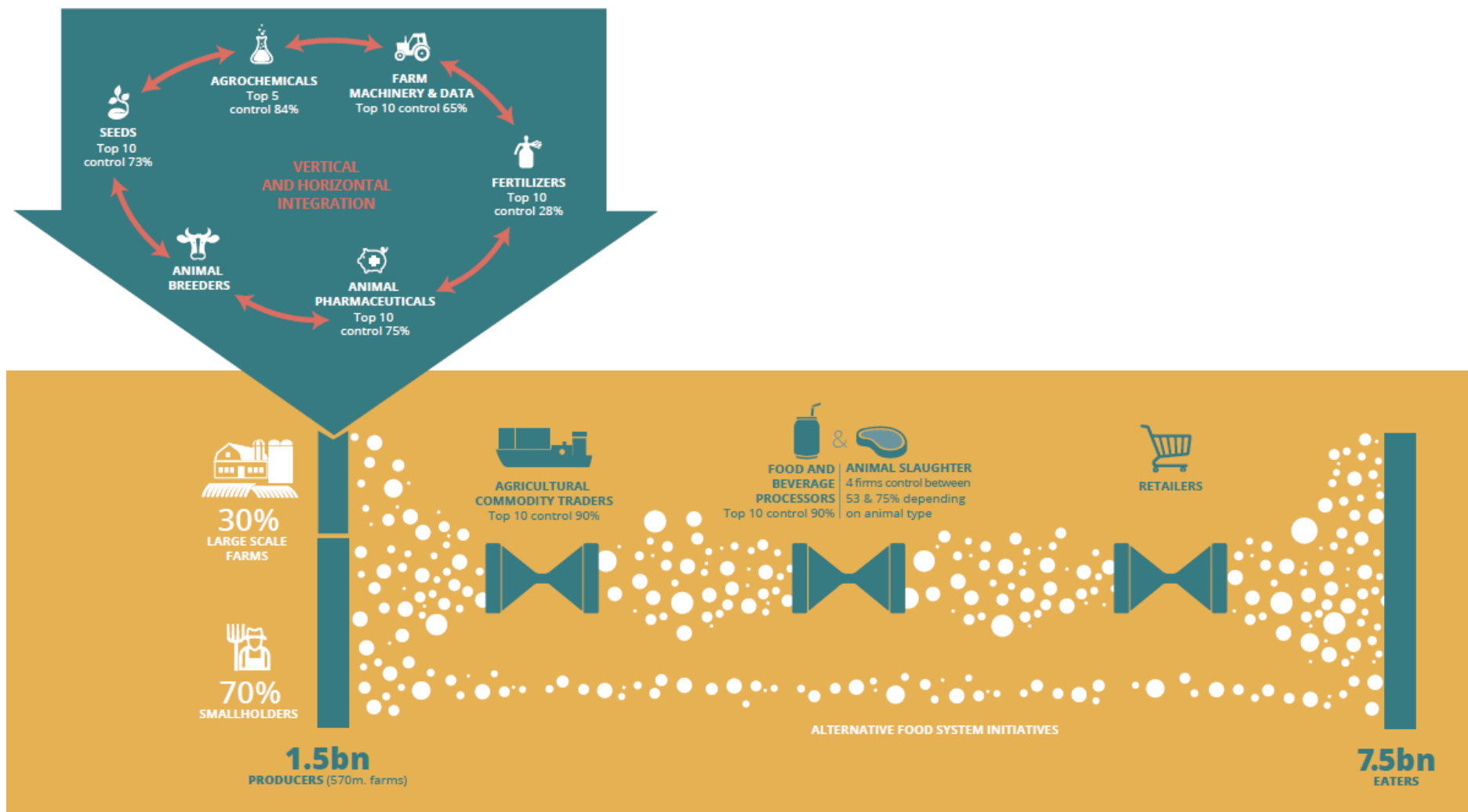


Figure 14: Concentration in the agri-food supply chain (Mooney 2017)

**Description.** As described by (Mooney 2017), at the level of input provision, concentration at the global level is high and increasingly growing:

- Three companies control more than 60 % of proprietary seeds and 70 % of agrochemicals;
- Ten companies own 56% market share for fertilizers;
- Eight firms dominate 80 % of the market for animal pharmaceuticals;
- Two to three companies supply all or almost all breeding stock (depending on animals);
- Three companies control 50 % of the market for farm equipment).

At the downstream level of chains, at the global level still:

- “Commodity trade is one of the most concentrated nodes of the chain”, with “four major corporations that produce, process, transport, finance and trade food and agricultural commodities (ADM - Archer Daniels Midland (USA), Bunge (USA), Cargill (USA), Louis Dreyfus Commodities (France), and additional Asian-based new players;
- Ten Food and beverage companies (including AB in-Bev/SAB Miller, Nestlé, Pepsico and JBS), account for 37.5% of the market share of the world’s top 100 food companies;
- “The world’s top ten grocery retailers make up 29.3 % of total sales”, including Walmart, Schwarz Group and Kroger. This rather lower figure hides highly concentrated markets on a regional level.

**Potential impacts.** The same study identified major impacts relating to this concentration in food chains, including (Mooney 2017):

- Redistributing costs and benefits along the chain, and squeezing farm income;
- Reducing farmer autonomy in a context of ‘mutually- reinforcing consolidation’;
- Hollowing out corporate commitments to sustainability;
- Escalating environmental and public health risks;
- Allowing labour abuses and fraud to slip through the cracks;
- Setting the terms of debate and shaping policies and practices.

**Policy responses.** Against this background, the EC directive on unfair trading practices was decided in 2019 explicitly “to stop larger businesses exploiting small and medium-sized suppliers because of their weaker bargaining position, and to avoid the costs of such practices being passed on to primary producers” (EC 2019). The directive sets a series of unfair trading practices out whose prohibition should be guaranteed by Member states. In France, the Egalim law for “Balanced trading relationships in the food and agricultural sector and for healthy, sustainable and accessible food” (2018) goes further by putting the increase in value creation and its fair distribution, as well as the payment of fair prices to farmers as main objectives, and proposes a series of measures (Ministère de l’agriculture et de l’alimentation 2018).

Given those issues at chain and worker levels, looking at the social sustainability of food products seems particularly relevant.

## ***1.2 Objectives of the review***

From the previous subsection, we have an overview of some issues in the agricultural sector, including the declining number of jobs, inequalities and poor employment and working conditions, as well as an overview of some (potential) systemic causes.

We have seen that S-LCA is criticized for being merely a reporting tool, not able to help decision making since it is not able to anticipate potential social impacts relating to a change in the functioning of product life cycles (Macombe and Falque 2013) (cf. 3.1.2 of the Introduction). We have also seen that most of the reviewed frameworks consider assessment C&I separately, and not in relation with each other's (cf. Chapter 1). Also when impact pathways are considered in the analysis, it looks mainly at the downstream side of impact pathways, but not at upstream side, i.e. at the problem's sources, so that it is unlikely that it will be able to derive improvement levers (cf. Chapter 2). Yet, while LCA is foremost an assessment tool, seeking to evaluate impacts, it should be able to identify improvement options, to provide information for environmental and sustainability management and for decision-making.

While most existing S-LCA frameworks do not seem to give the tools for S-LCA to contribute to an understanding of S&SE impacts in product chains (and thus to an improvement of impacts), how do S-LCA studies in a specific sector (food) perform in this regard? In this review we aim to address the following questions: in how far is current S-LCA application in the food sector able i) to assess impacts that are relevant in this chain and ii) to provide information that can be used to improve the situation and to help decision making?

The materials and methods used for the review are described in the next section, before the results are presented and discussed respectively in the third and fourth sections.

## **2. Materials and method**

### **2.1 Materials**

#### **Choice of reviewed studies**

We started our review from the various literature reviews existing already on S-LCA (Jørgensen et al. 2007; Parent, Cucuzzella, and Revéret 2010; R. Wu, Yang, and Chen 2014; Chhipi-Shrestha, Hewage, and Sadiq 2014; Delcour et al. 2015; Mattioda et al. 2015; Arcese et al. 2016; Petti, Serreli, and Cesare 2016; Di Cesare, Silveri, et al. 2016; Russo Garrido et al. 2016a). Further we identified extra publications by bibliographic searches with Cible+, Scopus and Google Scholar with specific key words. We also looked into conference proceedings, however abstracts were not considered given the level of details generally provided on the assessment and on the results. We selected 15 case studies in the food sector, that are listed in Supplementary material 3.

#### **Characteristics and methodological choices of studies**

Before presenting the results, it has to be noted that the methodological choices of studies (e.g. system boundary, type of data collection) may have implications on the described empirical results; thus, main methodological choices are specified in the same table (Supplementary material 3) and summed up below.

**Products and system.** Studies focus generally on the primary production (and processing for some of them) of fruits (10 studies, including 4 studies on tomatoes), livestock products (3 studies) and sugar (1) (cf. 3<sup>rd</sup> column). In terms of system boundary, most studies include the primary production, some include the processing stages and input production stages, but the latter through generic data only. One of these studies include the retailing, another focuses on the end of life of a food product (collection of used cooking oil), and none of them includes the consumption phase (cf. 4<sup>th</sup> column). Products where the primary production takes place in Europe (especially Italy) and North America are the most assessed (11 studies), with three case studies in Africa (Algeria, Cameroon and South Africa) (cf. 3<sup>rd</sup> column).

The **commissioner of the study** is not specified for most studies, suggesting that the initiative may come from researchers. Exceptions to this include two studies: one commissioned by Canadian Roundtable for Sustainable Beef (Deloitte 2016) and one by the Dairy Farmers of Canada association (Revéret, Couture, and Parent 2015).

**Frameworks.** We observe that most studies use the UNEP/SETAC Guidelines as a basis, directly or indirectly through the Social hotspot database (itself partly based on the Guidelines subcategories): this is the case of 11 out of the 15 reviewed studies. The rest of the studies focus on a particular methodological development such as testing the Life cycle attribute assessment approach (to calculate the most impacting/risky processes, (Andrews et al. 2009)), developing impact pathways (Feschet et al. 2012; Iofrida et al. 2019) or a specific indicator (Neugebauer et al. 2016) (cf. 5<sup>th</sup> column).

**Assessment C&I.** Studies applying the Guidelines and its list of subcategories apply it with certain flexibility: the set of assessment C&I is generally adapted to the context or the industry. Authors generally provide a short explanation of the basis on which C&I are selected (data availability, literature review) and/or on how the selection is made (stakeholder and expert consultation) (cf. 6<sup>th</sup> column).

Within the studies using the Guidelines, most of them do not include the five recommended stakeholders (cf. 7<sup>th</sup> column). Also, within a stakeholder category, most studies use only some of the subcategories or include other assessment criteria (cf. 8<sup>th</sup> column). Also, there are different understandings over which actors should be included in the analysis, according to the defined system boundary, and to the way that the question is framed. For example, some studies assess the working conditions of farmers and their workers (Nemarumane and Mbohwa 2015; Deloitte 2016), while others assess only those of farm workers (and not of farmers themselves) (De Luca et al. 2015a; Revéret et al. 2015); in this case it is argued that what is assessed is the behavior of farms towards other stakeholders (including workers) and not the farms' performances.

In terms of inventory, most studies use specific data (i.e. from survey or interviews) for processes taking place in the country where the study is conducted (where the commissioner of the study is located or where the primary production or processing take place) and generic data for remote processes. Apart from the few studies investigating or developing impact pathways (Feschet et al. 2012; Iofrida et al. 2019), LCIA is generally of type I, i.e. referencing, and a few studies only describe results, with no comparison to performance reference points (Nemarumane and Mbohwa 2015; Tecco et al. 2016).

## **2.2 Method**

In order to understand the kind of results derived from S-LCA studies and the use that can be made thereof, we extract the purposes and empirical results obtained in the selected studies. Those will be presented study by study in the Results section (3). The empirical results will be discussed in the light of the stock taking made in the introduction of this chapter about issues prevailing in the agricultural sectors of Northern countries. In this way, obtained results will be put in perspective with what we identified in the literature as main issues in the farming sector. This analysis will also give some hint about the issue of what is assessed in those studies, before the deeper exploration of Chapter 5. On the basis of the results described in (3.), we seek to analyze whether studies make it to provide information that can be used to improve sustainability performances and to help decision making. From this, we will draw conclusions over the usability of results of existing S-LCA studies in the food sector to improve the social sustainability of products.

### 3. Results

On the basis of this state of the art, we find that studies have two main purposes (as already mentioned in 1.3 of the introductory chapter) (cf. Table 9).

The first one is to improve the performances/potential impacts/potential risks (or the social sustainability)<sup>33</sup> of existing product life cycles (cf. 3.1). This is the goal of the large majority of assessed studies (11/16 studies). To do so, studies look at single existing product chains and identify main impacting processes and main issues or hotspots in broad systems, including several life cycle stages and stakeholders, with the help of lists of many C&I. Those results are obtained thanks to the referencing made that transforms qualitative into semi-quantitative data and scores for each issue, stakeholder and life cycle stage, as well as to the classification of processes according to the number of work hours required, whenever used.

The second one is to choose the best option/scenario to be implemented/supported (cf. 3.2). For this, authors compare the social sustainability of product life cycles according to different scenarios. Overall, studies comparing scenarios bring specific results, that are rather linked to the differences between scenarios, than to results of each scenario, which are less highlighted.

*Table 9: The two main objectives, uses, results and level of analysis of S-LCA studies (author)*

Objectives and potential uses	Methods and results	Level of analysis/Focus
<b>Improving the social sustainability of existing product life cycles</b>	Identification of the most impacting/risky processes within a product life cycle and/or of the related issues	Specific product chains/life cycles and average products chains/whole industries at national level
<b>Choosing the best option/scenario to be implemented/supported</b>	Comparison of performances/potential impacts/risks according to different scenarios	Ex-post and ex-ante assessment

The empirical results of S-LCA studies in the food sector are detailed in the following section. The first subsection details results of studies pursuing the first identified objective.

#### 3.1 Description of results

##### 3.1.1 Studies identifying the most impacting/risky processes and potential issues to improve the social sustainability of existing single product chains

Within those studies, some look at specific product chains (e.g. wine from a small Italian winery), while some others look at average product chains, generally at national levels (e.g. Canadian milk production).

###### Specific product chains

With a case study of Quebec greenhouse tomatoes, (Andrews, Lesage, et al. 2009) **identify the processes where actions should be taken in priority** (i.e. where the main company should implement CSR policy in priority) **on the basis of the proportion of involved worker hours** (when comparing to the number of work hours for the whole life cycle). They find that 75 % of work hours occur at the main company (the tomato company) and identify the remainder 15 main companies in terms of work hours as well as the nine companies that the tomato company can influence (through a CSR policy) because those are its direct suppliers.

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<sup>33</sup> In order to be comprehensive and to embrace all the kinds of assessment made with S-LCA, we use the term “social sustainability” when referring to performances, potential impacts and potential risks assessed.

Going beyond the identification of the most important processes, two studies **assess the performances of companies** involved in the production of wine (Ramirez, Petti, and Ugaya 2014), and tomato (Petti et al. 2016) in Italy for some subcategories of the Guidelines **in order to identify main problems**: these include for wine collective bargaining (because none of the workers are members of a trade union) and the non-compliance with a safety regulation; for tomato the access to immaterial resources (no evidence of the promotion of community services such as health/education/information sharing); and for both products the lack mechanisms on transparency, privacy and for consumer to make feedbacks.

Focusing on one specific indicator, (Neugebauer et al. 2016) assess the **fairness of wages along the life cycle of a tomato**, whose growing takes place in Germany, and input production abroad: “Results indicate potentially negative social impacts for workers employed in packaging and transport in Turkey and workers in manufacturing and packaging in China. In contrast, low impacts resulted for the Indian workers. No negative impacts are expected for the German and Dutch workers.”

(Bouزيد and Padilla 2014) assess the **social sustainability of the main Algerian processed tomatoes chain** and **compare the negative performances at farm level with the rather positive ones of the two other involved processes (cannery and nursery)**. These negative performances at farm level come from the hard and precarious work, the absence of social protection and the impossibility to constitute or join a trade union, as well as child labour”. Finally, the study highlights a tradeoff or a “mismatch between the labor time needed at each stage of production and the value assigned to each of these steps”, showing that “the most profitable segments of the production chain are those that present better work conditions” (Bouزيد and Padilla 2014, 60; 64).

#### Average product chains

(Benoit-Norris, Cavan, and Norris 2012) use the same method as (Andrews, Lesage, et al. 2009) **to identify the most important processes involved in the production of strawberry yoghurt in the US and assess the related risks**, with the help of the Social hotspot database. They find that most work hours happen in the US, in the dairy and fruit and vegetable sectors, which “may generate moderate social impacts in the supply chain” (Benoit-Norris, Cavan, and Norris 2012, 1956). They identify the following issues with very high risks in the US: “(1) the country’s refusal to ratify international labor conventions and (2) its deficiencies in collective bargaining rights for workers. Freedom of Association and the Right to Strike are also not well recognized”. In the fruit and vegetable sector “wages might not be adequate in keeping unskilled workers above the non-poverty guideline” [...] [and] there is also the risk of forced labor”. Other impacting countries and sectors include fresh strawberries from Mexico, agricultural and food additive chemical products and plastic containers from China and Venezuela, sugar from India and starches from China. Relating social issues include: Gender equity, low wages, lack of worker’s rights, child and forced labor, failures in countries’ legal systems to protect the workers or the local communities (Benoit-Norris, Cavan, and Norris 2012, 1960).

Focusing on one particular life cycle stage, (Chen and Holden 2016, 1) concludes that the average Irish dairy farm has “positive social impacts on value chain actors and society, predominantly positive impacts for local community and generally positive values for workers”. They **highlight the categories for which the standards are not reached**: health and safety (due to high working hours and high risks of occupational injuries), equal opportunities for workers (due to low proportion of women) and safe and healthy living conditions for local community (due to negative impacts generated by manure, fertilizers and feed production, on- and off-farm).

Similarly, (Revéret, Couture, and Parent 2015) assess performances of Canadian dairy farms which are on average overall good, with some variability. **Highlighted improvement areas** include for the farms to minimize the spreading of odors, to provide professional training and their contracts to workers and to consider in their procurement decisions the performances of their suppliers in terms of social responsibility. In parallel, the generic analysis focusing on first-tier suppliers concludes that “most supply chains show low social risk”, with main suppliers located in Canada or the US, but highlights some “troubling” practices such as corruption (“practices of collusion as well as bankrolling techniques from subsidiary companies of some major players” by fertilizer and oil extraction industries), unfair (or lack of) competition (retail and wholesale), unsafe working conditions (workers “generally not protected by labor standards” in grain and oilseed sector), non-respect of indigenous rights (“public health and conflicts of use of natural resources related to many industries, among them the pesticides and pharmaceutical sectors”) (Revéret, Couture, and Parent 2015, 61).

Within broader system boundaries, including additionally the downstream side of the supply chain, (Deloitte 2016) assesses the performances of the Canadian beef industry and “shows a majority of low and very low risks for the indicators assessed”. **Identified social hotspots** through the assessment include: the situation at risk for non-domestic workers in farms given national regulations and the non-ratification of international conventions regarding migrant workers’ rights, workload and excessive working time at cattle operations, injuries at the level of farms’ suppliers and workers’ income at the distributors’ level. Animal welfare shows low to very low risks at cattle operations and processing. Additional research with secondary data highlights potential high health and safety risks for farms and packaging activities, “environmental management practices, hourly wage at the farm level and temporary foreign workers conditions at the processors’ level” (Deloitte 2016, 6).

Focusing this time on a particular stakeholder, (Nemarumane and Mbohwa 2015) assess the social performances of the South African sugar industry **by describing situations of workers at growing and milling stages**. Growers and millers earn nearly a third of the South African minimum wage rate and do not benefit from wage-related incentives. The study also highlights gender inequalities (employment discrimination, unequal treatment in the workplace) and lists working conditions putting worker health at risk (e.g. dust particles) and main experienced health problems (e.g. backaches, shoulder, hips pains).

Next, results of studies comparing different scenarios are described.

### **3.1.2 Studies comparing performances/potential impacts/risks according to different scenarios to choose the best option/scenario to be implemented/supported**

Within those studies, some carry out an ex-post assessment of existing scenarios (e.g. comparison of growing conditions in three geographical areas), and some carry out an ex-ante assessment and seek to anticipate potential impacts linked to a change in the functioning of the product life cycle (e.g. to anticipate the potential impacts of doubling the bananas production in a given country).

#### **Ex-post assessment: comparison of existing alternatives**

Focusing on the end of life of domestic cooking oil, (Vinyes et al. 2012) compare performances of different scenarios to collect it (through schools, door-to-door, & through urban collection centres) and **highlights how scenarios address the three identified priorities**. The door-to-door collection system provides the highest number of jobs, including to disabled, but the school system contributes more to children environmental education.



Remaining studies compare growing scenarios. (De Luca et al. 2015b) compare the performances of the life cycles of citrus grown in Calabria according to scenarios that differ in terms of production mode/growing system (conventional, integrated, organic) and geographical area (3 different areas). They **classify the 6 scenarios and identify impact categories that contribute the most to performance differences**, given that stakeholders weighted each impact categories to end up with a final score per scenario. Before weighting, “in most scenarios, “Health and safety conditions at work”—here interpreted as a low incidence of diseases and accidents — contributed strongly to social-friendly performances, followed by “Use of IT and local knowledge” and “Equal opportunities.” Apart from those results, it is difficult to draw conclusions on which growing system or which area perform the best.

(Tecco et al. 2016) do not compare its results with performance reference points (referencing) but rather describe it, and compare effects of two scenarios for producing raspberry and **highlight the effects of adopting innovative agricultural practices** (i.e. the parameter that differs in the two scenarios), mulching and covering: in farms adopting such practices results are more satisfactory regarding working conditions, product workability and active management of climate risk, but global warming potential is higher given the use of materials. Overall, “the mulching and covering, implemented within a given framework of farm activity, created conditions for the preservation of a model in which raspberry production contributes to landscape protection, the business sustainability of farms and the creation of employment.”

(Iofrida et al. 2019) compare potential health risks linked to the life cycle of two functionally equivalent products grown in the South of Italy and **identify factor(s) that contribute the most to differences**. Overall, industrially grown oranges entail less risks than clementines, mainly because of the shorter duration of a single operation, the yield size and the duration of the harvesting phase. The study also identifies main involved diseases: musculoskeletal disorders, followed by osteoarthritis, disability, and cardiovascular diseases.

#### **Ex-ante assessment to anticipate impacts of a change in the functioning of a life cycle**

(Feschet et al. 2012) seek to anticipate the potential impacts (on health) of the doubling of banana production in Cameroon for export. In order to do that, they use a relationship/a pathway, that they developed, able to anticipate the impacts of generating economic activity and income through a product life cycle on the life expectancy of populations (the so-called Preston Pathway). An important part of the work of developing the pathway is to define the conditions for use; they found that the pathway can be used to anticipate impacts if four conditions for use are met: “(1) the activity is set within countries where the GDP per capita in purchasing power parity is less than \$10,000 at the start of the period, (2) the assessed activity accounts for a significant part of the annual GDP and/or demonstrates obvious signs that it represents a huge stake in the country’s economy, (3) the duration of the assessed activity is regular and long enough, and (4) the added value created by the activity is shared within the country.” (Feschet et al. 2012, 490). For the specific case of bananas exports of Cameroon, they found that the additional export of bananas of a specific company “would improve the potential [life expectancy] of the entire population of Cameroon by 5 days over 20 years, based on 200,000 t of bananas exported annually (in comparison with no activity) » (Feschet et al. 2012, 490).

### **3.2 Are the results consistent with literature review?**

In this subsection, we shortly discuss whether the results obtained by reviewed studies match the issues that we identified in the introduction about employment and working conditions in farming sectors of Northern countries (1. Introduction).

#### **A discrepancy between S-LCA results and identified issues**

The reviewed studies highlight poor working conditions in farms of assessed product chains of Southern countries (Benoit-Norris, Cavan, and Norris 2012; Bouzid and Padilla 2014; Namarumane and Mbohwa 2015; Neugebauer et al. 2016), and rather good working conditions in the ones located in Northern countries (Benoit-Norris, Cavan, and Norris 2012; Chen and Holden 2016; Deloitte 2016; Neugebauer et al. 2016; Revéret, Couture, and Parent 2015; Petti et al. 2016; Ramirez, Petti, and Ugaya 2014). While some studies mitigate those good performances in Northern countries (heavy workload in Irish dairy (Chen and Holden 2016) and Canadian beef farms (Deloitte 2016) in addition to low hourly wage, risks in terms of wages and forced labor in the US fruit and vegetable sector (Benoit-Norris, Cavan, and Norris 2012), non-respect of labor standards in the Canadian grain and oilseed sector (Revéret, Couture, and Parent 2015)), most studies in which primary production occurs in Northern countries, offer a different, often less problematic, picture of the farming sector, than the one described in the introduction of this chapter. Against this background, we may ask why such a discrepancy appears.

#### **Potential reasons for such discrepancy**

**Relevant assessment criteria/performance reference points?** On one hand, when looking at results of (Petti et al. 2016; Ramirez, Petti, and Ugaya 2014), some highlighted issues (taken from the UNEP/SETAC Guidelines) do not seem to be consistent with the (small) scale of companies and/or to the geographical context. For example, can we expect a farm to have mechanisms in place on transparency, privacy and for consumer to make feedback on products? Also, does a farm in Italy have to promote community services such as health/education/information, given the facilities already in place in the country? This relativism might come from the fact that processes occurring in very different contexts are assessed with a generic tool (same assessment criteria and performance reference points whatever the context) (Ramirez, Petti, and Ugaya 2014; Petti et al. 2016) or within the same study (Benoit-Norris, Cavan, and Norris 2012; Neugebauer et al. 2016; Revéret, Couture, and Parent 2015). Those examples show the potential need to adapt the Guidelines list of subcategories to the study context, and/or to make the list more relevant to any context, whenever possible.

**Stakeholder definition.** On the other hand, whether farmers are included in the analysis (in addition to farm workers) seem to influence the obtained results (cf. 2.1 Materials). In fact, main issues of workload/working time and wages/incomes are mentioned in only a few studies. Thus, not including farmers in the analysis may alter results quite strongly, especially given the prominence of small scale farms globally.

As a conclusion, the picture is mitigated: in some studies only, there is a match between results and the issues that we identified in the introduction of this chapter. In this context, while a number of those studies assess average product chains, we may ask about the specificity of the other specific assessed product chains, or about the relevance of the assessed C&I for some of the studies, since they do not make it to highlight major and known problems in food chains (cf. Chapter 5).

### 3.3 What kind of generalizable results can be drawn?

In this subsection, we seek to identify main trends or results that can be generalizable on the basis of the reviewed studies. Overall, we find five main types of determinants of social sustainability that are uncovered by the reviewed studies: the geographic and socio-economic context where the process occurs, life cycle stages, industries, production techniques, configuration of product life cycles/chains and other more specific parameters such as added value distribution and related profitability.

**Geographic and socioeconomic context.** Not surprisingly, reviewed studies covering all life cycle stages highlight generally poorer working conditions for processes located in Southern countries than those located in Northern countries (Benoit-Norris, Cavan, and Norris 2012; Neugebauer et al. 2016; Revéret, Couture, and Parent 2015). This excludes the fair wages for Indian workers in substrate production uncovered by (Neugebauer et al. 2016).

**Industries.** Also, other studies highlight the differing performances of specific industries located at the same life cycle stage: (Iofrida et al. 2019) find higher risks for worker health in clementine than in industrial orange production.

**Life cycle stages.** In an interesting way, (Bouزيد and Padilla 2014) show a link between life cycle stages and social sustainability, and the particular much less fortunate position of workers in the farming sector, when compared to the nursery and processing stages. Similarly, (Benoit-Norris, Cavan, and Norris 2012) and (Revéret, Couture, and Parent 2015) find that social risks are higher upstream the chain (in feed production) than in livestock farming. However, this link is not necessarily found by other studies (Deloitte 2016; Namarumane and Mbohwa 2015; Neugebauer et al. 2016).

**Production techniques/configuration of product life cycles/chains.** Finally, studies assessing several scenarios highlight clear-cut differing performances according to chain configuration (Vinyes et al. 2012) or production techniques (Tecco et al. 2016). In the same vein, (De Luca et al. 2015a) seek to differentiate performances according to growing techniques (organic/conventional) and to the geographic area, but results are less straightforward, likely because the study uses a large number of impact categories and two differentiation parameters for the scenarios.

**More specific parameters, such as added value distribution and resulting profitability.** In addition to highlighting the differing performances according to life cycle stages, (Bouزيد and Padilla 2014) go further by connecting the performances in terms of working conditions and the level of added value per labor unit assigned to each step. Low added value would thus act as a constraint for farms to provide good working conditions, hence the need to distribute added value more fairly between life cycle stages. This is also the case of (Feschet et al. 2012) who state that for economic activity to impact positively on health, a substantial amount of added value should be attributed to workers through wages, as a condition for use of the Preston pathway. In this way (Bouزيد and Padilla 2014) and (Feschet et al. 2012) connect added value creation and distribution with working conditions and positive health impacts for workers. On a same note but informally (in the recommendations), (Deloitte 2016, 242–44) explains the heavy work load and excessive working time borne by farmers with the low margins received: *“the economic assessment [conducted in a separate study] showed that producer viability and industry characteristics may be causing this outcome [in terms of workload] due to potential pressure to increase, or at least maintain, a certain level of productivity and profitability that may require a higher workload than what is commonly-observed in other industries [...] management practices around these different factors should be explored during the next phase of the study to identify possible solutions for the industry to be both economically viable and socially responsible.”*

On the basis of those findings, we are able to draw conclusions over how can S-LCA bring results to the study commissioner, value chain actors, public authorities or consumers that can help improve product sustainability or to push towards such development.

## 4. Discussion and conclusion

On the basis of the obtained results, we aim to discuss whether studies make it to provide information that can be used to inform sustainability management and decision making.

### *4.1 How useable are study results to reach their objectives?*

**Studies comparing scenarios to help decision making.** (Feschet 2014) argues that, to be used in decision making, S-LCA should compare scenarios. Results from such studies are indeed directly useable by decision makers in most cases, in the condition that they assess the relevant indicators, and the relevant life cycle stages and stakeholders: the berry cooperative or the farmers can decide to switch to covering and mulching techniques if the aim is to improve working conditions (Tecco et al. 2016), a municipality can decide to implement a door-to-door collection system to create jobs (Vinyes et al. 2012), or public authorities to support the production of industrial orange at the expense of clementines if their goal is to improve worker health (Iofrida et al. 2019).

**Studies assessing single chains: less clear-cut contributions to the improvement of product sustainability.** This is not the case of studies assessing single product chain for which the use of results for meeting their objective is less clear-cut. Those studies share the objective of improving the social sustainability of products life cycles, but there seems to be a missing link, since after the identification of most impacting processes and related issues, the question of how to address identified problems remains. In those studies, controversial practices of life cycle companies are singled out and denounced, without necessarily looking for reasons of such practices and for improvement levers. Related to this, assessed criteria and stakeholders are generally considered in isolation, which seems a missed opportunity for a life-cycle approach-based tool.

Some of the reviewed studies suggest improvement actions or recommendations, in addition to the assessment (Petti et al. 2016; Deloitte 2016; Namarumane and Mbohwa 2015). However, those recommendations do not always point to major changes in product chain since it does not point to potential root causes of problems, but are rather basic recommendations. For the identified problem of unfair pay for sugar millers and growers, one of the recommendations is “the employers are also urged to provide workers with their rightful wage rates as prescribed by the basic conditions of the Employment Act” (Namarumane and Mbohwa 2015, 105). Thus, an external assessment such as done by a classical type I S-LCA may bring an alternative view to the study commissioner and good recommendations that could not have been seen by someone having the nose to the grindstone. However, it is unlikely that such recommendations will make a difference: we suppose that there are reasons for companies to behave the way they behave. If constraints are not removed or levers not activated, major changes are not likely to happen.

**Studies providing a systemic analysis: usable results for improvements.** However, we have seen from the results of reviewed studies, that when there is a comparison of results between life cycle stages and when results of specific indicators are related to each other's, meaningful recommendations can be made on the basis of identified potential drivers of negative impacts, as in the study of (Bouزيد and Padilla 2014).

## ***4.2 Main recommendation and conclusion***

### **Including parameter(s) as stressor/instrumental/explanatory variables in the assessment**

Thus, for studies assessing single product chains to be able to provide sound recommendations for improving sustainability performances, it seems that results should be analyzed in a systemic manner and that indicators reflecting potential drivers of main problems (e.g. potential drivers of low wages) should be included in the analysis. The assessment will then be used to assess performances in terms of wages (and other assessment criteria), but also to check whether the identified potential drivers influence performances. In this way, the assessment can go beyond a mere reporting and description of performances. This is what some of the reviewed studies did, but informally: (Bouزيد and Padilla 2014) assessed added value distribution in addition to working conditions and then relate both results, and (Deloitte 2016), looked at value chain actors profitability (that was assessed in a separate study on economic aspects), in parallel to the range of 'social' sustainability aspects and then relate both results. Both studies conclude that poor working conditions (expressed in terms of excessive working time) reporting in farms might come from the low value caught by those farms, in comparison to other value chain actors. Returning to a recommendation made earlier (cf. 4.2 of chapter 1), those drivers or parameters (having an instrumental value) should be included as stressor or explanatory variables, while other assessment criteria (having an intrinsic value) should be included as impact or explained variables.

### **S-LCA as a tool to help understand mechanisms that lead to low or high social sustainability**

If conducted in this way, S-LCA could help understand mechanisms leading to poor or good employment and working conditions in product chains. Just as E-LCA does when uncovering processes or inputs responsible for main environmental problems in product life cycle, S-LCA could help uncover the appropriate levers to be activated by companies or to be supported by policy makers and consumers to improve social conditions.

### Supplementary material 3: S-LCA case studies in the agricultural and food sectors

Author date	Summary	Functional unit/ product	System boundary	Framework applied	Basis for the selection of C&I	Stakeholders considered	Number of C&I	Inventory/data collection	Type of LCIA method and interpretation
<b>(Andrews et al. 2009)</b>	Application of the LCAA (Norris 2006) in which the most impacting processes or country-specific sector according to the number of work hours is calculated, with a case study on tomatoes produced in Quebec.	\$US100 of tomatoes from a large greenhouse in Quebec	Production of tomatoes & inputs production	No framework applied. Test of the LCAA method.	Criteria selected for the example	Workers, local community, society	8 attributes	Specific & generic data	I/2-level scale (Yes/no) and comparison between life cycle stages
<b>(Benoit-Norris and al. 2012)</b>	Social Scoping assessment of strawberry yoghurt produced and consumed in the US to determine most impacting processes following (Andrews, Lesage, et al. 2009) & identification of main social issues, with literature review & SHBD gathering data on 20 themes.	US\$ 1 million of strawberry yoghurt produced & sold in the US	Production processes Cut-off criteria: if CSS less than 0.1% of the total worker hours	Social hotspot database	SHDB topics and indicators	Workers, local community, society	18-20 social themes, 39 indicators Idem	Generic data Idem	I/For each CSS and theme, assessment of risks on a 0-3 scale. With the work hours calculation, calculation of a Social hotspot Index.
<b>(Bouزيد and Padilla 2014)</b>	Analysis of the social performance of activities linked to the production of processed tomatoes in the most important Algerian canning company: plant production, agricultural production, and processing.	1 kg of processed tomatoes ex-factory	All activities of the canning industry Amor Benamor (CAB): one nursery, 150 farms and 1 canning plant	Adaptation of the UNEP/SET AC Guidelines	Following Kruse et al. (2009), Dreyer et al. (2006), Andrews et al. (2009)	Workers	7 topics	Specific data: interviews with nursery and canning plant, questionnaires sent to managers of 150/300 farms	I/Comparison with law + identification of trade-offs between working time and value added per labor unit
<b>(Chen and Holden 2016)</b>	Assessment of social impacts of an average dairy farm with S-LCA	1 kg of energy corrected milk (ECM) at the farm gate	From cradle to farm gate, with some exceptions (e.g. infrastructure) due to lack of activity data	Application of the UNEP/SET AC Guidelines	Data availability	5 stakeholder categories	19 indicators	Generic data: statistics at national and sectorial level	I/Different referencing according to data and indicator type (semi-/quantitative, relatable to functional unit)
<b>(De Luca et al. 2015a)</b>	Application & test of methodological developments to a case study comparing SSE impacts of 3 different crop systems of citrus growing (organic, integrated, & conventional) in 3 areas of Calabria (Italy)	1 hectare of clementine orchard	Planting to harvesting at farm level	Adaptation of the UNEP/SET AC Guidelines	Literature review, statistical, territorial analysis & focus group with local experts for final selection	Workers (excl. farmers), local community, society.	7 impact categories, 16 criteria, 25 indicators	Specific data towards 50 farms & regional generic data	I/Mix of indicators: qualitative: binary scoring; quantitative: min-max normalization. Weighting: Analytic hierarchy process with stakeholder consultation

Author date	Summary	Functional unit/ product	System boundary	Framework applied	Basis for the selection of C&I	Stakeholders considered	Number of C&I	Inventory/data collection	Type of LCIA method and interpretation
<b>(Deloitte 2016)</b>	Study commissioned by the Canadian Roundtable for Sustainable Beef (CRSB) identification of the social hotspots and environmental impacts of the Canadian beef production. Alongside, an economic assessment is carried out separately.	Canadian beef	From cradle to retail stage (incl.)	Application of the UNEP/SETAC Guidelines	Some of the subcategories excluded because not relevant to the context/sector	5 stakeholder categories and future generations	26 criteria	Specific data for farms (76) and meat packing industry (86%) + secondary research. Generic data for other life cycle stages.	I/Risk assessment with 4-level scoring system, using international, national, or industry standard as PRP and completion with an expert evaluation
<b>(Feschet et al. 2012)</b>	Test of the Preston pathway describing the link between economic activity & health impacts, with a case study on the setting up of a bananas export value chain in Cameroon	200000 tonnes of dessert bananas exported from a port annually (Cameroon)	Gate to gate, from banana plantations to the port	No framework applied, impact-based choice of C&I.	Impact-based		2 indicators, GDP & life expectancy at birth	specific data: accounting data from the banana company	II/Impact pathway
<b>(Iofrida et al. 2019)</b>	Proposition of the psychosocial risk factor impact pathway for assessing occupational health risks linked to the growing of two citrus	Citrus grown in South Italy	Growing stage	No framework applied, impact-based choice of C&I.	The assessed working conditions are the one occurring in both scenarios	Workers	12 working conditions and health impacts	Specific data on processes and working conditions	II/Impact pathway
<b>(Nemarumane and Mbohwa 2015)</b>	Assessment of social impact of the sugar industry in 3 provinces of South Africa	To produce sugar	Sugar growing, harvesting, & milling phases	Adaptation of the UNEP/SETAC Guidelines	Factors identified as relevant areas of concern within the sugar industry for both millers and growers	Workers (growers and millers) & local communities	5 criteria, 16 indicators	Specific: 300 questionnaires sent to millers, growers & communities	No LCIA carried out: description of results, without reference points.
<b>(Neugebauer et al. 2016)</b>	Assessment of a specific product chain of tomatoes produced in Germany to test the general applicability of the "Fair wage impact assessment method" (cf. chapter 2)	German tomatoes	From cradle-to-gate: input production, tomato production, packaging and transport	No framework applied, focus on a particular indicator.	Focus on one indicator, not designed to be comprehensive	Certain workers (operators or technicians)	1 indicator	Processes performed in Germany: specific Other processes: generic (from the created database)	I/Real wage and working time compared to statutory working time and living wages. Distance to target approach.

Author date	Summary	Functional unit/ product	System boundary	Framework applied	Basis for the selection of C&I	Stakeholders considered	Number of C&I	Inventory/data collection	Type of LCIA method and interpretation
<b>(Petti et al. 2016)</b>	Implementation of the subcategory assessment method (SAM) to the life cycle of an Italian variety of tomato called Cuore di Bue produced by an Italian cooperative.	1 kg of tomato Cuore di Bue, meeting nutritional needs of an individual.	Input production to packaging. Cut-off: labour hours of each process unit, analysed from cradle to market.	Application of the UNEP/SETA C Guidelines	Only subcategories relating to 3 stakeholders. Choice made according to data availability and priority of the company.	Workers, consumer and local community	22 criteria and indicators	Specific with questionnaires to company administration, employees, delegates of trade union, local communities, consumer organisations.	I/4-level scoring system for each subcategory with SAM. PRP: legislation or organisational practices and country context. Identification of improvement actions.
<b>(Ramirez, Petti, and Ugaya 2014)</b>	Application of the SAM (subcategory assessment method, Ramirez et al. 2014), on a case study on a small Italian winery.	Production of 75 mL of 'novello' wine	Grape & wine production phase	Application of the UNEP/SETA C Guidelines	Use of the Guidelines subcategories for the 2 stakeholders, without justification	Workers & consumer	14 criteria, 25 indicators	Specific: interviews	I/4-level scoring system for each subcategory with SAM.
<b>(Revéret, Couture, and Parent 2015)</b>	Assessment of socioeconomic performance of Canadian milk production (farm, sector & board levels) & risk assessment at a generic level	1 kg of fat & protein corrected milk from a Canadian farm, to the processing facility	Feed production to transportation at the gate of the processing facility	Application of the UNEP/SETA C Guidelines	Specific analysis: with literature review, experts' opinions, focus groups among stakeholders. Generic analysis: with SHDB (adapted)	Workers (excl. farmers), local community, society, value chain actors	30 criteria, 67 indicators	Specific at the farm, board & sector levels & generic for the upstream part of the value chain	I/Specific: performance assessment with 4-level scoring system/Generic: risk assessment with 3-level scoring system
<b>(Tecco et al. 2016)</b>	Assessment of the introduction in raspberry farming of innovations into agro-food systems (mulching and covering) by combining an E-LCA and S-LCA to support the decision making process of a fruit growers co-op.	1 kg of raspberry produced by the co-op members.	Cut-off criteria: life cycle phases impacted by the introduction of these innovations. Distribution and consumption excluded	Adaptation of the UNEP/SETA C Guidelines	Focus group of 8 representatives of various stakeholders, and evaluation with a top down approach using the Guidelines and sectoral case studies.	Co-op farmers producing Raspberries and warehouse workers	11 criteria	Specific: questionnaire for each stakeholder category for 42 farms of the co-op	No LCIA carried out: description of the analyzed social aspects and analysis of social repercussions of innovations.
<b>(Vinyes et al. 2012)</b>	Comparison of the sustainability of three domestic used cooking oil (UCO) collection systems in Spain: through schools, door-to-door, & through urban collection centres	To collect oil in an area of x inhabitants/year	Collection & treatment of used cooking oil	Adaptation of the UNEP/SETA C Guidelines	Functional unit, data availability, context, characteristics & limitations of collection systems	Workers, society, consumers, local community	5 criteria, 8 indicators	Not specified	I/5-level scoring system. Conversion of results into contribution percentages, with the highest result being equal to 100%.



## **2<sup>ND</sup> PART: METHODOLOGICAL PROPOSALS AND A SPECIFIC FRAMEWORK FOR S-LCA**

In this second part, we present first our methodological proposals for S-LCA, that are directly drawn from the earlier parts and recommendations (Chapter 4). On the basis of those proposals, we built a framework for S-LCA that will be applied in the third part of this thesis, and that is tailored to our application (Chapter 5).



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## CHAPTER 4: Methodological proposals for SLCA

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Sureau, Solène, and Wouter M. J. Achten. 2018. "Including Governance and Economic Aspects to Assess and Explain Social Impacts: A Methodological Proposal for S-LCA." In *Social LCA, People and Places for Partnership - 6th Social LCA Conference*. Fruitrop Thema. Pescara, Italy.

This chapter gathers and structures the recommendations that have been made and drawn from the three states of the art presented in the 1<sup>st</sup> part. In a first section, we address six questions that have emerged during the course of this research work.

### 1. From state of the art to general principles to configure and conduct S-LCA

#### 1.1 Type I (reporting) or type II (investigating impact pathways): what use of S-LCA?

We have seen that most S-LCA frameworks and studies look at the behavior or practices of life cycle companies regarding their workers, consumers and local communities, but they rarely look at potential stressors of those practices, as exemplified by the fact that most studies overlook criteria relating to value chain actors and their relations, including economic relations (Chapter 1 and 3, and the forthcoming chapter 5). Currently, type I S-LCA studies *report* on social problems and assess social performances, but they do not aim to understand the *reasons* of problems and thus do not include explanatory factors of these problems in the analysis. On the other hand, type II studies seek to assess the potential social impacts of (change in the functioning of) product life cycle, i.e. impacts experienced by people on their health and wellbeing. They seek to include impact pathways in the analysis by looking downstream impact pathways, towards endpoint impacts (Chapter 2). But there is a lack of research work looking at what can potentially influence the midpoint impacts, and thus at relationships between those midpoint impact indicators and their potential stressors or explanatory factors. Yet E-LCA characterization focuses on links between environmental problems (midpoint) and their stressors (materials used and emissions, i.e. inventory data) in addition to links between problems (midpoint) and damages (endpoint or AoP). As such E-LCA makes it possible to explain environmental phenomena and damages and to highlight problem sources (processes or use of certain materials). If stressors of midpoint impacts (i.e. what we propose to call explanatory variables) were included in the S-LCA assessment, it could become a tool to assess, but also to manage and to improve impacts.

**We propose** to include impact pathways in S-LCA, in addition to the reporting of social problems. More specifically, we propose to include impact pathways looking upstream, towards root causes, contrary to existing type II approaches (cf. Figure 15 and Figure 16). Concretely, we propose to include, as assessment criteria, potential explanatory factors of main problems existing in product chains, including poor working conditions and inequalities. Potential explanatory factors are variables with an instrumental value, and other assessment criteria are variables with an intrinsic value (cf. conclusion of Chapter 1).

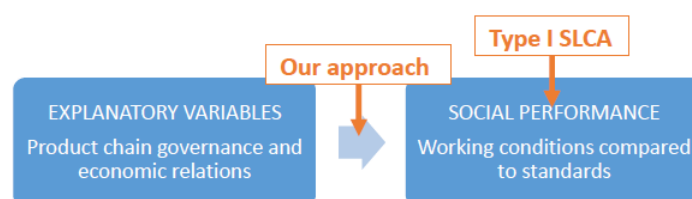


Figure 15: Our proposal in comparison with type I SLCA

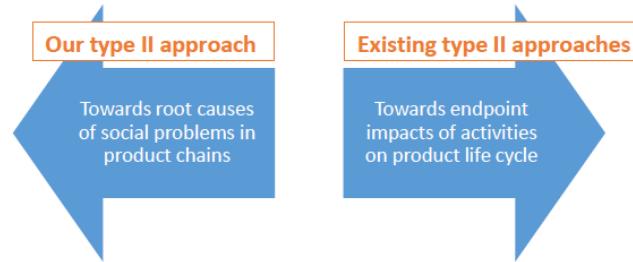


Figure 16: Our proposal in comparison with existing type II approaches

## 1.2 How to select assessment criteria?

We have seen that there is as yet, no agreed list of assessment criteria, with many frameworks proposed (cf. Chapter 1) and the Guidelines list of subcategories questioned (3.1.1 of introduction) or not applied as such (Chapter 3). Behind this issue lies the discussion of the non-relevance of some of the Guidelines subcategories, but also of the normative character of the list, with subcategories all not scientifically justified. At the same time, some authors argue for or have included some participation in the configuration of S-LCA frameworks (cf. Chapter 1 and 3 (Mathe 2014; Wangel 2014; De Luca et al. 2015b)).

**We propose** to use a participatory approach to define assessment criteria, so that chain actors of product chains define themselves what is important and what is (social) sustainability. In S-LCA, the use of such an approach is still very limited, while it has been experimented for other assessment tools. We agree that “social indicators would need to gain public acceptance to be valid” (Clift 2003), but also that chain actors and citizens are knowledgeable, and that such knowledge should be valued and used. With this proposal, we position ourselves in the debate around the necessary scientific justification of assessment criteria and we assume that there is room for normativity in S-LCA (cf. more details in the forthcoming chapter 5).

## 1.3 How to articulate impacts/indicators or how to identify impact pathways?

While the participatory approach is useful to define what should be assessed, there is a need to articulate C&I, so that S-LCA is able to go beyond reporting, towards the understanding of practices. We have seen that several ways are used to identify impact pathways or general frameworks for S-LCA (expert and stakeholder consultation, existing scientific knowledge) (cf. chapter 2). On the other hand, several call to draw on existing researches in social sciences (Grubert 2016; Arvidsson et al. 2014; Iofrida et al. 2016) and to reinforce theoretical grounds of S-LCA, especially when it comes to impact pathways (Jørgensen et al. 2009; Feschet 2014a; Iofrida et al. 2016).

**We propose** to draw on existing theoretical frameworks, including in social sciences (e.g. economics, sociology, management, development studies) to articulate C&I. These theoretical frameworks are themselves drawn from empirical observations. On the other side, SLCA could be used as an empirical tool to test and to potentially further feed the used theory. In order to comply with the 1<sup>st</sup> proposal (cf. 4.1.1), we argue to use theories that seek to explain or understand main problems found in product chains (e.g. poor employment and working conditions). In fact, it seems the priority given the seriousness and urgency of problems in product chains (ILO 2015; 2014; 2017b).

In addition, it would be interesting to investigate impact pathways taking as a starting point the variables that are used in type I studies for two reasons. First, these variables are widely used by SLCA practitioners and are likely very relevant. Secondly, in this way, a bridge could be built between type I and type II studies. The theoretical framework that we use in the application part of the PhD is the Global Commodity Chain approach, as further detailed in chapter 5.

The articulation of C&I could also be done through a participatory approach. The participatory approach gives the floor to on-the-ground and experience-based knowledge. Such an experimentation has been made within the COSY-Food project, but was not fruitful (cf. Chapter 5). An appropriate method to reach a consensus over this articulation among stakeholders has to be found.

#### ***1.4 What types of variables should be assessed?***

The discussion above brings us to the key issue of what is to be assessed. When looking at impact pathways included in current Type II approaches investigating and applying pathways, we can conclude that these are limited to E-LCI, income and health variables, i.e. mainly quantitative variables, for which there is an easy access to data at macro level for the latter ones (one notable exception is the recent study of (lofrida et al. 2019) linking exposure to certain working conditions and health impacts). This is however not the case of approaches identifying impact pathways (1), which include much more diverse variables that get close to what is being assessed in Type I S-LCA (Chapter 2).

**We consider** that we should not limit ourselves to quantitative models and variables, because such a limitation will necessarily hamper the coverage and potential comprehensiveness of S-LCA. Thus, qualitative variables relevant to S-LCA (e.g. including the issue of employment and working conditions in the supply chain) could be addressed. We argue that S-LCA should not be adapted to fit the E-LCA format, but S-LCA should be tailored to explain social mechanisms by considering the (social) nature of assessed impacts or phenomena, implying other variables and methods.

#### ***1.5 How to investigate impact pathways (which data, which method)?***

We have seen that most studies investigating impact pathways use statistical methods, implemented with generic data, often at macro level (Chapter 2).

**We propose** to use S-LCA to build knowledge on problems in product chains and on cause-effect chains relating to product life cycles. More specifically, we propose the investigation of impact pathways to be done through the carrying out of S-LCA studies based on specific data, collected on-site. In fact, information on supply chains is poor in general, and we consider that SLCA should be used as an empirical tool to gather information on product supply chains. This would then suppose that all investigated variables be observable, and would thus exclude certain non-observable variables on e.g. health impacts, which are rarely observable at the time that the study is carried out. But a number of other variables and impact pathways could be investigated this way. Another potential limitation is the method that can be used: if the sample is too small (because of the use of specific data), it might not be possible to call upon statistical methods to investigate impact pathways. Other, more qualitative methods will then have to be used.

### ***1.6 What to assess (or which sustainability approach)?***

We have seen that S-LCA frameworks or studies barely consider economic and chain governance aspects in supply chains (chapter 1, 3 and forthcoming chapter 5). They look mainly at managerial, organizational and 'social' aspects in supply chains (how workers are employed, who is employed, what are the working conditions, what do companies do regarding consumers and local communities). While S-LCA was born following the emergence of the sustainability concept, a particular conception/approach of sustainability was used: the three-pillar approach, in which the environmental, economic and social pillars are taken into account, but separately, and which excludes governance aspects.

**We propose** to adopt an alternative approach to sustainability and not to limit assessment criteria to the 'social' pillar, but to extend them to other (economic, governance, environmental) pillars. Our assumption behind this proposition is that chain governance and economic aspects influence the social sustainability of products. Excluding governance and economic aspects from the analysis would thus prevent the use of S-LCA as a tool that can help the understanding of main problems in product chains. This assumption underlies the theoretical approach chosen to articulate our S-LCA framework (the Global commodity chain theory, cf. forthcoming chapter 5): this one assumes that chain governance influences the way that the value is distributed between value chain actors, which in turn influences employment and working conditions implemented by value chain actors. While we argue that a nested-approach to sustainability is more relevant as a conceptual framework to configure S-LCA than the 3-pillars approach, we consider that the Global commodity chain is one of the theory that can be used to articulate assessment C&I, and that other theories could be used.

In brief, we argue for the use of a participatory approach to select assessment criteria among all sustainability pillars, and for a LCIA combining type I and type II, with impact pathways drawn from theory, looking upstream, towards the root causes of problems in supply chains. We also argue for the use of S-LCA as a way to investigate impact pathways, with the use of specific data. Thus S-LCA can contribute to build knowledge on supply chains issues and relating causal mechanisms.

With those proposal, we argue for a shift from an assessment that looks at impacts, sustainability dimensions and product chain actors separately to a holistic assessment tool that considers links between them. Particularly, economic aspects relating to the product and value chain governance aspects could link product chain actors, and might have the potential to capture potential transfers of impacts between them, if our theoretical approach is verified.

## 2. Conceptual approach and methodological proposals for S-LCA

### 2.1 Conceptual approach

This discussion brings us to present the conceptual approach underlying our methodological propositions. Figure 17 illustrates the inter-connection that we consider between the classical three pillars of sustainability, that are usually considered separately within S-LCA and LCSA (cf. 2.1.2 of introduction). Focusing on the assessment of social impacts, impact pathways start from physical flows relating to product life cycle as well as monetary flows. From physical flows, some social impacts mostly linked to human health can be derived as part of S-LCA <sup>[1]</sup>, since other impacts on human health (those deriving from environmental problems) are part of E-LCA <sup>[2]</sup>. Monetary flows through the distribution of added value among economic actors of the chain are the main stressors of social problems/issues <sup>[3]</sup> and impacts <sup>[4]</sup> since these flows constrain the behaviors and practices of economic actors regarding other stakeholders: workers, consumers, local community, society, but also other value chain actors. In turn, these flows rely on the way that the chain is governed, i.e. on the power relationships between value chain actors <sup>[5]</sup>. Thus, the payment of an income generating price, or a fair price, depends on the type of governance prevailing in chains in which economic actors are playing. Depending on other, more contextual factors, like the degree of market openness and the level of concentration at specific stages (processing, wholesale, retailing), the power between actors will be differently balanced <sup>[6]</sup>.

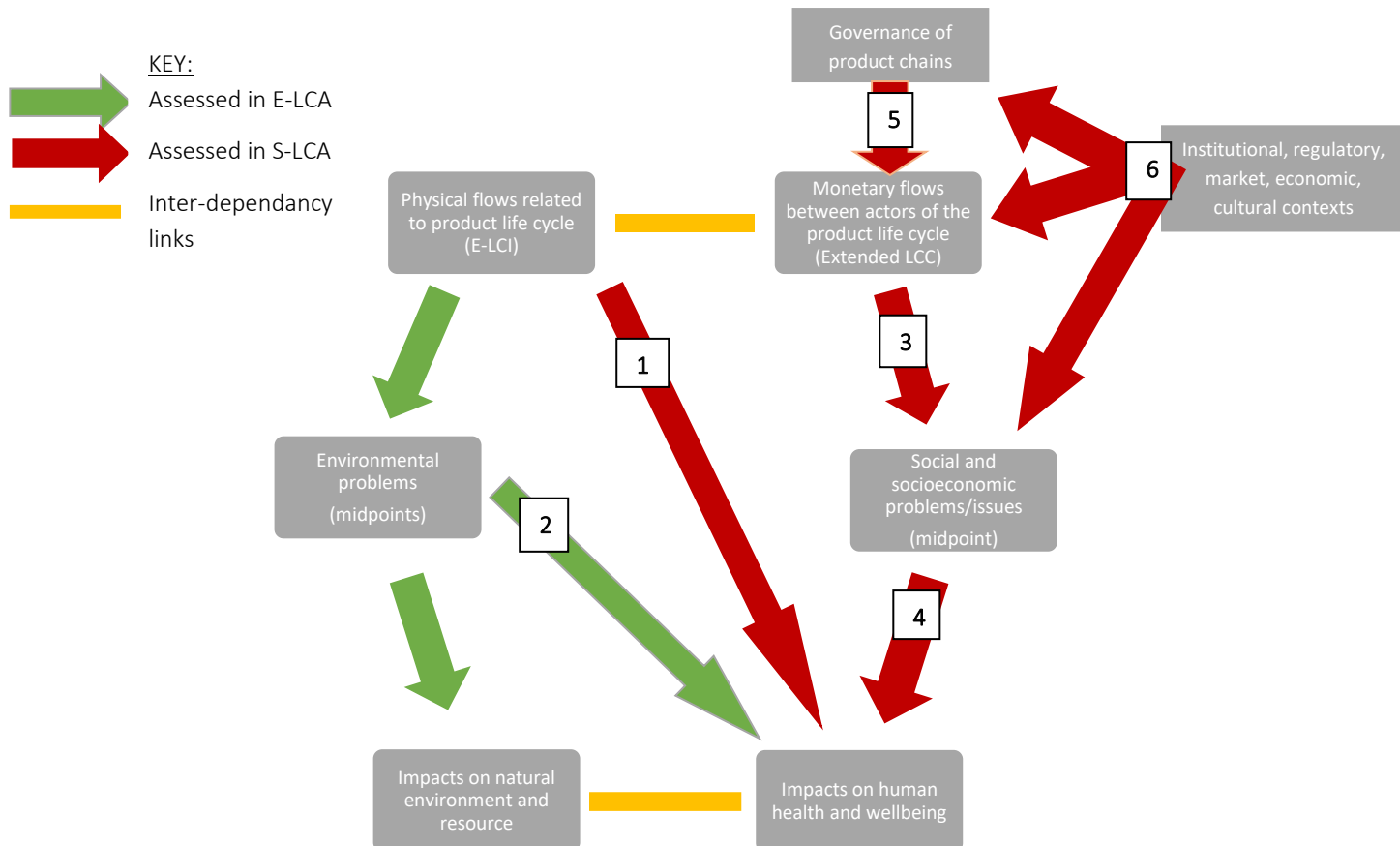


Figure 17: Conceptual approach underlying our methodological proposals for S-LCA

## 2.2 Our methodological proposal integrated in S-LCA steps

In this sub-section, we integrate our propositions in LCA steps and describe how S-LCA should be conducted. The main steps of our methodological propositions are detailed in Figure 18 below.

### Goal and scope

First, assessment criteria are selected among all sustainability aspects <sup>[1]</sup> with stakeholders of assessed product chains <sup>[2]</sup>. These stakeholders should gather various stakeholders: consumers, retailers, wholesalers, processors, primary producers, and workers of those value chain actors.

### Inventory

For the inventory, we recommend the collection of specific data for as many processes as possible. Generic data might be used preferably to put inventory results in perspective, and for processes for which access to specific data is not possible.

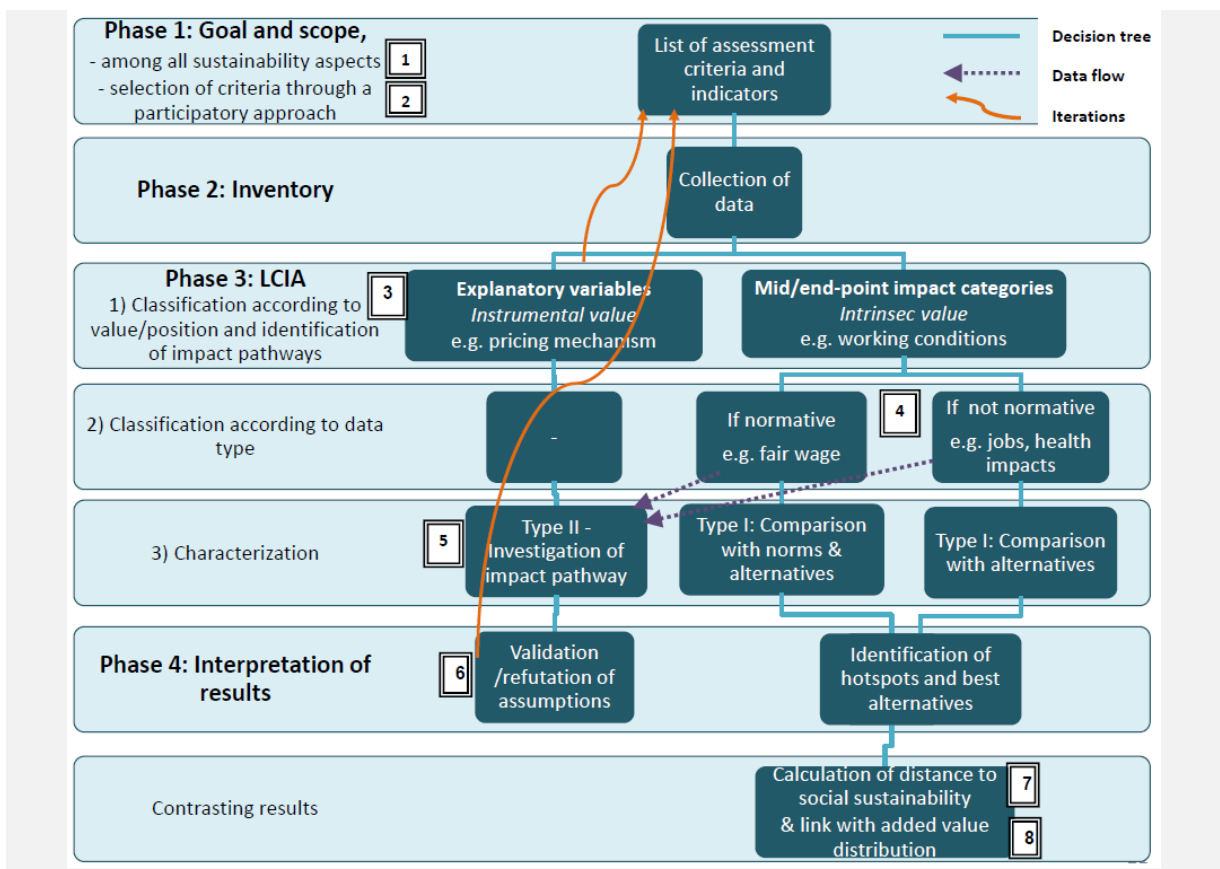


Figure 18: Our generic methodological proposals for SLCA

### Life cycle impact assessment and interpretation

- We propose as a new LCIA step the identification of impact pathways and the classification of selected assessment criteria as stressor or impact variables <sup>[3]</sup> (Sureau et al. 2017; chapter 1).
- Impact and explanatory variables are then characterized/referenced with a type I LCIA. For normative variables (e.g. fair wage), reference points should be defined through the participatory approach, with the support of e.g. norms applicable in the geographical area where the product is consumed and other alternatives (if any) for other variables (e.g. labor intensity of processes) <sup>[4]</sup>.



- Explanatory variables are processed together with impact variables with a Type II characterization that investigates identified impact pathways [5]. We thus propose a LCIA combining Type I and Type II as suggested by Chhipi-Shrestha et al. (2014).
- Depending on whether these variables are found to influence social impacts, recommendations for inclusion/exclusion thereof in future assessment are provided [6].
- The type II LCIA relating variables to each others can be considered as a phase where results of the type I LCIA are interpreted.
- In the last phase, we propose to use an additional way of interpreting results and to put them in perspective, whenever available data makes it possible: we propose to apply an existing approach which calculates the distance to sustainability, i.e. the “Eco-Social cost” (Croes and Vermeulen 2015) [7].

This approach monetarizes “impacts” with externalized preventative costs, i.e. costs that are necessary for negative impacts to be avoided. It implies the definition of thresholds that cannot be exceeded. Thus, while monetarization is considered as reflecting a weak sustainability approach that legitimates a substitution between capitals, the type of monetarization we propose to apply is close to the strong sustainability approach (Roman et al. 2016).

Behind the use of this approach is the assumption that prices do not cover all costs and that low prices result in negative social (and environmental) impacts. By putting in perspective the retail price of a product (or a price at another stage of the value chain) with externalized preventative social costs, the tool would contribute to raise awareness of consumers regarding the true costs of products, thus supporting economic actors in adjusting prices whenever necessary. Another benefit is to make economic actors reflect on improvement options that they can implement to reduce negative impacts and on factors that permit improvement, but are initially considered outside their sphere of influence.

- In order to verify our basic assumption, we propose to test the relationship between the importance of externalized preventative social costs and the distribution of added value along the value chain (or the retail price) [8].

### 3. Limits identified at this stage

At this stage, we can identify several limits to our methodological proposals including limits to we seek to tackle and limits that we leave open.

#### ***Participatory approach: applicability issue and time- and resource-consuming process***

Our proposal to use a participatory approach as a way to configure the assessment framework (including criteria, indicators, performance reference points) involving chain actors of assessed chains is a resource- and time-consuming exercise. As explained in the next chapter (5), we can apply this approach with the support of a 3-year project that funded non-academic actors as well, but also because assessed chains are local chains (and the system boundary of the study is limited to processes occurring locally), meaning that only actors localized in the same geographical area are involved in the process. The exercise can obviously not be replicated without such a support and would be more difficult in another context.

The proposal to use a participatory approach originates in the critics that have been addressed to the assessment criteria proposed by the Guidelines for S-LCA but also to the rather free use made thereof

by S-LCA case studies, which could demonstrate a certain non-applicability or irrelevance for some of the criteria (cf. 3.1.1 of Introduction, and forthcoming Chapter 5 and 8 for more details).

We believe that such a participatory approach is a way to produce a relevant list of assessment C&I, but at the same time it does not meet the requirements of an LCA tool able to assess today's product chains, which includes necessarily processes located in various geographical areas. In this context, we consider the exercise that we propose as i) a way to make the assessments conducted in this PhD relevant and meaningful for the assessed local chains, and ii) as a way to eventually feed the list of the subcategories of the Guidelines and proposed indicators, so that they gain in relevance and applicability.

### ***Investigating impact pathways through S-LCA studies: limited to certain issues and variables***

While our proposal to investigate impact pathways through S-LCA studies seems feasible for certain variables, it does not seem so for issues which are not observable such as health impacts, which have been the focus until now of most type II studies. In this context, it has to be noted that our proposal does not aim to replace but rather to be added to the various means that are and can be used to investigate impact pathways. Our point here is that adequate methods have to be used according to the nature of issues (socioeconomic issues, health impacts) and variables (qualitative versus quantitative, observable versus not).

### ***Access to data and amount of data***

Another potential limit to our proposals is the access to data which is presumably an issue in any S-LCA study, but can be even more significant when applying our methodological proposals. In fact, by including other sustainability aspects, such as governance or economics aspects, the amount of required data might increase (especially if the Ecosocialcost is applied). Also, those data are likely to be sensitive, even more than other issues relating to e.g. workers, and thus not easy to access. This could hamper the applicability of our methodological proposals.

This is one of the reasons why we chose AFNs chains as field of application: we assume that the collection of data will be easier given the localization of chain actors (from primary production to consumers), but also given their likely willingness to share data, since we want to verify with those applications the higher social sustainability of those chains, in comparison with mainstream chains.

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## CHAPTER 5: A specific framework for S-LCA: from a participatory approach to the investigation of relationships between chain governance and other social sustainability aspects

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Sureau, Solène, François Lohest, Joris Van Mol, Tom Bauler, and Wouter M. J. Achten. 2019b. "Participation in S-LCA: A Methodological Proposal Applied to Belgian Alternative Food Chains (Part 1)." *Resources* 8 (4): 160. <https://doi.org/10.3390/resources8040160>

As described in the previous chapter, the list of C&I is to be built through a participatory approach, with chain actors (cf. 4.1.2) and C&I are to be articulated with a specific theoretical framework (cf. 4.1.3). In this chapter, we explain how those two proposals have been applied within the framework of the Participatory action research project COSY-Food.

### 1. Introduction

With growing pressure from consumers and communities as well as public authorities and markets, companies are more and more required to account for their performances in terms of social sustainability, i.e., identify, assess, and improve the impacts linked to their activities (Feschet 2014). This call for improved and more holistic, systemic, multi-dimensional assessments is supported by the international community; Sustainable Development Goals include the promotion of decent work (goal 8) as well as of responsible consumption and production (goal 12) (UN n.d.). In this societal and policy context S-LCA should help value-chain actors reduce their impacts on the one hand, and should ideally enable consumers to make informed choices. Beyond the theoretical objective of assessing the multidimensionality of impacts, the operational issue of what should be assessed and measured with an S-LCA tool remains a crucial, yet strongly discussed issue in the field (cf. Chapter 1). The present paper aims to contribute to this rapidly evolving practice of S-LCA.

We have seen that several methodological frameworks to conduct S-LCA exist (e.g., Guidelines for S-LCA of products (Benoît and Mazijn 2009)), proposing different lists of assessment criteria (or what is called "impact categories" or "subcategories" in the UNEP/SETAC (United Nations Environment Programme/Society of Environmental Toxicology and Chemistry) Guidelines for S-LCA) and indicators (C&Is) (cf. Chapter 1). Also, even when applying existing frameworks such as the UNEP/SETAC Guidelines for S-LCA, practitioners tend to adapt such lists of C&Is to the specific geographical or sociopolitical context and/or to the industry under assessment (Sureau, Mazijn, and Achten 2016). As a consequence, the object of assessment tends actually to differ between S-LCA studies. In the context of heterogeneity by practice in terms of assessment C&I, the UNEP/SETAC Guidelines for S-LCA and the Handbook for Product Social Impact Assessment—which are two of the main frameworks developed to conduct S-LCA—are (being) updated. The revision of the latter has been recently completed, while the revision process of the former is currently in process (Social LC Alliance 2018; Goedkoop, M.J., Indrane, D., and de Beer, I.M 2018), and awaits its first operationalization. Thus, the present chapter aims to contribute to these formal, institutional, international exercises by opening the discussion (and practice) to a blind spot.

Indeed behind the question of what is assessed lie actually the questions of what the developed criteria and indicators (C&Is) really reflect as impacts, and how that selection of C&Is is really made, and whose understanding and prioritization of impacts gains access to the C&Is. Quite often, the basis of these

selections and adaptations of C&Is simply are international treaties and policy documents, voluntary standards, or adjacent assessment tools; and their contextualized translations into C&Is are simply operated by the respective authors of the assessments. Occasionally, when the selection is not done entirely by the conductors of the assessment themselves, the process of selection and adaptation includes the consultation of the private sector, or of experts (cf. Chapter 1 and (Sureau, Mazijn, and Achten 2016). While there are obvious calls to extend these consultations to other actors (Mathe 2014) (cf. Section 2), currently, S-LCA remains rarely configured via the consultation of stakeholders. Thus, applying a participatory approach in S-LCA processes remains a methodological challenge with potential benefits for an ongoing international discussion. The present chapter is related to an attempt to test participatory S-LCA in particular with respect to its applicability and relevance within a participatory-action research project named COSY-Food.

The COSY-Food project aimed to assess the sustainability of local food products traded under three different, alternative distribution systems (alternative food networks or systems; AFNs, a more detailed definition of AFNs is provided in the introduction of the 3<sup>rd</sup> part) in Belgium. AFNs include various “alternative” forms of food production and distribution such as community-supported agriculture, consumer food co-operatives, or farmers’ markets. Their alternativeness relates to their promise to mitigate the heap of negative sustainability impacts of the mainstream, agro-industrial food system (Forsell and Lankoski 2014). This project was developed in a co-creational modus, meaning that knowledge was generated collaboratively “by academics working alongside stakeholders from other sectors” (Greenhalgh et al. 2016). As a co-creational or participatory action research project, COSY-Food involved three academic researchers and three field partners, or co-researchers, which are the facilitators/retailers from the three AFNs. Our set included an organic shop, a web-shop for local products (organizing a weekly farmers’ market), and a network of community-supported agriculture (CSA), in which a group of consumers subscribe to a harvest of a certain farm and receive in return a weekly box of farm goods.

Simplified, the first stage of the project co-created a definition of what is a sustainable food system in the Belgian/Brussels context, which was then translated into a list of assessment C&Is. The second stage applied these C&Is specifically to the assessment of two food products traded under the three alternative distribution systems, eventually leading into a comparison with the mainstream food system whenever possible (in parallel, another set of C&Is was configured—based on the same sustainability definition—as a basis for a second tool designed to assess distribution systems and their supply chains and to be implemented by the AFNs themselves). The present chapter discusses the first stage of the project, i.e., the configuration of the assessment tool by defining C&Is (referred to as the first part of the article), while the 6<sup>th</sup> chapter focuses on the second stage (i.e., the assessment itself and the application of the assessment tool).

This chapter exposes a methodological proposal to the participatory definition of assessment C&Is in the general context of S-LCA, with the means of a participatory-action-research project. The paper examines the potential contributions, limits, and requirements of this proposal and strives to formulate recommendations that could feed the ongoing revision process of the UNEP/SETAC Guidelines (Social LC Alliance 2018). Indeed, considering the latter was rather built through a top-down approach, involving stakeholders and experts at a regional or international level (i.e., trade and professional associations, consumer associations, etc.), the integration of results from a rigorously straight bottom-up approach, as is the present one, could be seen as very complementary.

First, we present a short state-of-the-art on the use of participatory approaches in S-LCA (Section 2). Next, we develop on the process of building a list of C&Is for S-LCA through a participatory process involving food-chain actors (Section 3), and its result (Section 4). Indeed, such a participatory process has been rarely implemented in S-LCA, while it has been recommended by several authors. The story of our exercise will help us discuss the contributions (mainly for the stakeholders involved), requirements, and limits of such a process (Section 5.2). While it would be counter-intuitive to appraise the quality of the list of obtained C&Is in absolute terms, we will discuss the C&Is by comparing the set to other comparable studies in the food sector using other C&Is selection methods. This will drive us discussing more broadly what should be assessed in S-LCA (with the revision of the UNEP/SETAC Guidelines in mind) (Section 5.1). While the present chapter aims for careful generalization in the specific context of S-LCA, the configured list of C&Is is clearly meant to be applicable to the assessment exercise depicted in the 6<sup>th</sup> chapter; applying it to any context and to other assessment applications would betray its intended contextualization by participation.

## 2. The use of participatory approaches in configuring S-LCA C&Is: added-value, and limits

The consultation of stakeholders (or participatory approach) as a way to select C&Is has been highlighted as relevant and needed, given the specificity and contextuality of social and socioeconomic issues under assessment by S-LCA. Literature speculates that social indicators would need to gain public acceptance to be valid (Clift 2003), and participatory approaches would enhance the legitimacy of the results (Mathe 2014). Additionally, as social C&Is should be context-dependent, a consultation of stakeholders would improve their adaptation to the context (Freebairn and King 2003; Mendoza and Prabhu 2000) in (Mathe 2014). As highlighted by (Mathe 2014), considering the plurality of stakeholder interests and of local knowledges, participation enables the selection of “impact categories that make sense for stakeholders in different contexts”, simplifies the process of indicator identification and promotes dialogue, partnerships, learning, and empowerment at the level of the stakeholders involved (Mendoza and Prabhu 2000; Fraser et al. 2006) in (Mathe 2014). Finally, participation would enhance the quality, appropriation, and usability of the tool in itself (Mathe 2014; Rey-Valette H. et al. 2008).

Participatory approaches to select assessment C&Is have been implemented to some extent in other non-LCA related assessment fields (Van Calster et al. 2005; Veldhuizen et al. 2015; Reed and Dougill 2002; Boulanger et al. 2011; Bell and Morse 2004), but rather rarely in S-LCA, where “the choice of the impacts is generally determined in a normative fashion using standards established in international conventions [...] or national laws” (Mathe 2014). Yet, several S-LCA authors recommend or propose stakeholder consultation/participation as a way to identify assessment criteria from scratch, either solely by participatory approaches (Mathe 2014; Wangel 2014; 2018), or in combination with other processes (e.g., literature review) (Silveri 2016). In a previous review (Sureau, Mazijn, and Achten 2016), we found that if stakeholder consultation is used, it is generally merely to select or validate assessment C&Is *from an existing framework* (such as the Guidelines for S-LCA (Delcour et al. 2014; Nemarumane and Mbohwa 2015; Tecco et al. 2016; Revéret, Couture, and Parent 2015; Manik, Leahy, and Halog 2013), rather than to select C&Is *from scratch*. For instance, we identified one particular study in the fields of S-LCA and life cycle sustainability assessment (LCSA, which considers other sustainability aspects, beyond social and socioeconomic ones, see (Valdivia et al. 2011) for more details), with a detailed published list of C&Is stemming from a participatory process involving various stakeholders (Souza et al. 2015).

While promoting the approach, Mathe (2014) warns about its implications and requirements. A participatory approach requires “a multidisciplinary approach and the integration of new knowledge and skills for S-LCA practitioners” (Mathe 2014, 1507). It also requires more time and resources, and the availability of participants throughout the process. Finally, using such a participatory approach would prevent, by design, the comparability of results over different contexts.

In the following section, we present the materials and methods used for this exercise.

### **3. Materials and methods: configuring C&Is with a participatory approach**

This section describes how the selection of C&Is was conducted (i.e., what process was used and, how, and which stakeholders were involved). The process of configuring the list was an iterative one, switching between in-house academic desk research, the co-creational interactions with co-researchers (i.e., AFN retailers/facilitators), and the consultation moments with food value-chain actors (VCAs) and final consumers. Thus, operationally, the process spun over two levels/modes of participation: i) The level of co-creation which took place during the whole project duration between co-researchers from academia and the field, and ii) the level of consultation which was often one-time but involved a much wider range of stakeholders.

Main steps of the procedure were the following:

- Step 1: Academic researchers review the criteria used in comparable selected sustainability assessment tools (including S-LCA) and standards (list 1), and identify pertinent C&Is candidates.
- Step 2: In parallel, the 3 co-researchers from the field identify assessment criteria on the basis of their distinct practices and sustainability objectives (lists 2–4) and are asked to classify those according to the 3-pillars approach to sustainability (this classification was challenged by co-researchers and was consequently given up, see further discussion on this issue in Sections 3.2 and 5.2).
- Step 3: Academic researchers merge and organize these 4 lists into a principles, criteria, and indicators frame (P,C&Is), and co-researchers validate it. Chain actors of the three AFNs are consulted and asked to provide feedback on the consolidated list. Academic researchers and co-researchers integrate any comments to configure an improved list of principles and assessment criteria (P&C general list, cf. Table A1).
- Step 4: From this P&C list, academic researchers build a secondary list of assessment criteria specifically framed to S-LCA. This list is structured with stakeholder categories and a specific theoretical framework. Finally, a set of corresponding indicators and performance reference points are identified, with the support of co-researchers and literature; and questionnaires are elaborated for data collection (C&Is list for S-LCA, cf. Table 1).

#### ***3.1. Principles for building the list of C&Is with a participatory approach***

During the consultation process, participants were asked to define what a sustainable food system is. For participants to express their preferences in a structured way, we used the support of the principles, criteria, and indicators framework. Principles correspond to relatively generic objectives that are to be reached by AFNs, e.g., economic viability. Criteria are linked to one principle and correspond to the conditions for principles to be met. One or more indicators measure each criterion.

Regarding the stakeholders involved in the consultation process, (Mathe 2014) advises to include three categories of stakeholders in the participatory process: value chain stakeholders, users of the systems, and institutional stakeholders. These three stakeholders all satisfy the following three criteria: They “are affected differently (impact criteria) by [the product life cycle] whether in terms of exchange (e.g., value chain stakeholders), taxation (e.g., public services), or level of well-being (e.g., users)” ; they represent a certain “diversity of social representations (completeness criteria)” ; and “representative individuals in each category division (legitimacy criteria)” (Mathe 2014, 1512). Within the COSY-Food project, the choice of the type of stakeholders to be included in the consultation process, done with the co-researchers limited the consultation process to both value-chain actors (including employees/workers) and the food systems’ users (i.e., consumers). Operational constraints entailed to exclude institutional stakeholders and public authorities. Looking at (Mathe 2014) criteria to select stakeholders, local communities could have been included since these can be affected by the product through the taxation of the product occurring at various life cycle phases and the resultant public services available for local communities, and their inclusion through elected representatives would have increased the diversity of social representations. However, elected representatives were not selected to participate in the consultation process.

Value-chain actors of the three AFNs were included in the consultation process; on the first line, because they are project partners (i.e., retailers/those facilitating the retail); in a secondary line, some of their wholesalers, processors, primary producers were consulted equally. Systems’ users were represented by final consumers of the retailers/retailing systems. The sampling was made according to whether or not value-chain actors were major suppliers to the AFNs, depending on data access (for the final consumers) and—of course—depending on their availability to participate to the workshops. In the end, between 20 and 37 persons per AFN (value-chain actors and final consumers taken together) were consulted through this process. Thus, the sample is representative of stakeholders frontally involved in the three specific AFNs. This choice could limit any subsequent applicability of the tool for products from other food systems (or chains), but is obviously unavoidable in order to capture first-order participants to the 3 AFNs. It is their views on sustainability which is vital to the S-LCA, given that these AFNs explicitly pursue the objective of being sustainable, particularly on social and socioeconomic aspects.

While the principles of the consultations are generally quite straightforward, participatory and co-creational exercises are intriguingly difficult to grasp in detail. Hardly any descriptions exist of what exactly a thorough consultation implies. We describe the tasks of steps 1-3 in Annex (cf. supplementary material 4: The participatory process for building the list of principles and criteria, in French). In the following subsection, we chose to give our process some flesh by detailing out decisions and orientations taken in step 4 (which is more specific to S-LCA), with the aim to allow others to take inspiration.

### ***3.2. Focus on step 4 (1): from the P&C list to C&I for S-LCA***

At step 3, the co-creation process resulted in a list of 70 criteria linked to 16 sustainability principles (cf. 5. Discussion). Overall, principles contain several criteria corresponding to sub-elements relating to the same theme (e.g., criteria “work contract stability” under principle “decent working conditions and worker wellbeing”). This principles and criteria (P&C) list covers a wide range of issues directly relevant for the various consulted stakeholders (various value-chain actors, consumers, workers), but integrates also broader societal issues (e.g., territorial development, cultural heritage, food sovereignty, fauna and flora).

To be used for S-LCA purpose, the P&C list required some adaptation. A first adaptation was the removal of environment-related criteria from the list; being covered in environmental LCAs, these environmental criteria were non-pertinent in a S-LCA context. Therefore, we excluded the “environmental pillar” principles from the overall P&C list. This means that for the assessment of social sustainability, we used all P&C identified (through the participatory process) to define overall sustainability, but the environmental P&Cs. The remaining P&C list is considered as a definition of *social sustainability*. This understanding of social sustainability is indeed rather broad, since it includes, next to social issues, elements that can be considered as belonging to the economic and governance pillars. This approach may have implications for the assessment itself. It originates from the difficulty met the academic- and co-researchers in the process of delimiting what should be in the “social pillar” or not, since most identified issues were considered as “transversal” and potentially causally linked with each other.

Second, the configuration of indicators for each criterion being actually iterative with the refinement of the criterion itself, it appeared that several selected criteria were rather indicators (e.g., number of intermediaries was selected but seemed to be rather an indicator of the chain length than a criteria).

Third, some criteria had to be adapted due to biases implied by the decisions taken on the selection process. On one hand, stakeholders were asked to define what a sustainable food *system* or chain was, rather than what a sustainable food *product* was. This means that criteria have a system-focus rather than a product- or organizational focus, as it would be more generally expected in S-LCA. On the other hand, the co-researchers from the field are retailers (or facilitators in the case of the CSA network) of short chains for two of them. Although other value-chain actors (producers, wholesalers, final consumers) were consulted, retailers/facilitators as co-researchers had more influence in the process. As a consequence, some criteria gained a “retailer-focus” or “short-chain” bias, and had to be made more generic to fit to a larger set of life cycle organization (e.g., both farms and industrial processors).

### **3.3 Focus on step 4 (2): Structuring the list and articulating C&Is**

During the configuration process of the list, the structuration of the list was questioned. In fact, co-researchers felt that a number of criteria were linked to more than one principle, and that the transversal nature of sustainability elements could not be expressed with a typical PC&Is architecture, in which criteria are linked to one principle only and which does not allow to express links between principles or criteria themselves. As a consequence some criteria are doubled in the list (e.g., the criteria number of intermediaries appear under principles “fair trade practices” and “awareness raising and practices improvement”). Specific criteria were abandoned for being too transversal (e.g., the principle/criteria “(human) size of VCAs”), or too ambiguous notably with respect to the cause–effect relationships they were supposed to link (e.g., “commitment between VCAs and stability of income/takings” or criteria “cooperative management and participation of stakeholder to decision making” under principle “fair trading practices” instead of being positioned under principle “solidarity, social ties, and participation”).

In order to address this causality issue, the research team conducted a further participatory process in which academic- and co-researchers sought individually to identify “their” causalities according to their knowledge, beliefs, and norms. As an overall result, each criterion was linked to several principles and inversely, each criterion was linked to other criteria. While this web-like, complex-system result confirmed the intuition that criteria should be untied from their initial basic principles, the sheer complexity and the high number of identified causal links would not have allowed to identify one specific sequence of impact pathways or one narrative.



### **Structuring the list with the stakeholder input**

Consequently, the list of P&C was restructured by removing principles and the stakeholder approach from 2009 S-LCA UNEP/SETAC Guidelines (Benoît and Mazijn 2009) was used to classify according to whether criteria regard workers, final consumers, VCAs, and relations between them, or broader societal issues. While this restructuring solved some of the above-raised problems (e.g., unclear relation between principles and their criteria), the issue raised by co-researchers over the unexpressed interlinkages between sustainability elements and assessment criteria remained.

This consideration echoed critics raised about the lack of conceptual and theoretical frameworks underlying S-LCA, particularly the so-called type I/reporting S-LCA, that gives rise to descriptive only and “heterogeneous list of indicators chosen in an empiric and arbitrary way [...] with no way to explain social phenomena, articulation and interactions between assessed dimensions” (Feschet 2014a, 163). Thus, several researchers argue that theories, including from social sciences, should be more prominently used to configure S-LCA because theory can provide a coherent framework of analysis (Feschet 2014; Jørgensen et al. 2010; Iofrida et al. 2016), especially when identifying impact pathways (Sureau et al. 2019, chapter 2).

### **The Global commodity chain approach as a theoretical frame to articulate C&Is**

To cater for these calls for analytical frames, our assessment grid was linked to the Global commodity chains (GCCs) approach, that echoes particularly well the rationale underlying the AFN movement, with its focus on balanced and fairer trading relationships. The GCCs approach looks at how global chains are organized and structured as well as at authority and power relations between chain actors (i.e. the governance of the chain) (Gereffi 1994). Accordingly, chain governance would structure the way that goods and services are produced and traded, and to “determine how financial, material and human resources are allocated and flow within a chain” (Gereffi and Fernandez-Stark 2016, 10).

This theoretical approach has already been used by an LCA study at the beginning of S-LCA research, but received no attention from further S-LCA research. This study sought to include socioeconomic indicators to assess impacts of food products of traditional globalized chains of a major UK retailer (Sim 2006). In her study, Sim sought to verify the relationship between the chain governance structure and the distribution of added value, and finally with social impacts (wage levels of workers), but with limited success.

### **Origin of the approach**

This specific theoretical approach developed in the 1990s in the field of development studies at a time where the industrial landscape evolved quite strongly (cf. 1.2.3 of introduction). The GCC has been first conceptualized by world-system theorists Hopkins and Wallerstein (1986). GCC was defined as “a network of labor and production processes whose end result is a finished commodity” and was seen as a concept “to examine geographical dispersion of production activities [...] [and] to identify which firms and countries retained the most profitable nodes within the chain, thus uncovering the uneven distribution of profits among them” (Lee 2010, 2989).

In the early 90’s, researchers from development studies, Gereffi and Korzeniewicz (1990) reformulated and gave it a fresh impetus with the development of an analysis tool that focuses on the organization of global industries, the identification and mapping of actors and the analysis of the relationships between them in order to understand how value is created and distributed along the chain (Bair 2005). The latter would indeed provide a potential explanation for the difference between the growth of total

economic surplus of developing countries and the growth of their industrial output, and for the differentiated economic upgrading that countries can experience (Lee 2010, 2989).

### Main contributions of the GCC/GVC approaches

The GCCs approach unveiled the growing and dominant role of global buyers (retailers, branded marketers, industrial processors, and international traders) in value chains. These global buyers emerged in the 1980s from the process of horizontal integration of firms, with a move of merges and acquisitions leading to oligopolistic situations downstream value chains, which concentrated power within few actors. On the other hand, there has been a vertical disintegration of firms, with a large move of outsourcing from main firm (located in Northern countries) to other legally independent entities (more and more located in Southern countries) (Locke 2013; Baudry and Chassagnon 2014). This move has changed ownership patterns, but lead firms would exert a control beyond their boundaries. In fact, “while the modern firm has defined legal boundaries – its legal personality –, its economic perimeter goes beyond property and contractual obligations » (Baudry and Chassagnon 2014, 104). In this context, production activities can be now globally dispersed, but they are linked by specific types of relations: lead firms control the supply chain in terms of price, quality, delivery conditions, and “suppliers dedicate their production activities to those firms on which they rely completely” (Baudry and Chassagnon 2014, 104). At the same time, outsourcing activities made it possible for firms to shift risk (Gibbon, Bair, and Ponte 2008) and responsibility towards upstream suppliers.

In this framework, **competition and innovation** are proposed to be the “key factors that determine which nodes are more or less profitable” (Lee 2010, 2990). In fact, the degree of competition in a node would determine the market power of companies of this node, determining in turn their profitability: “the more severe the competition is in a particular node, the smaller the share of surplus that generally accrues to the node. By the same token, the more a node is monopolized by a few units, the bigger the share of surplus that goes into them. The profitability of the nodes, however, is hardly static, but is rather subject to technological and organizational innovations” (Ibid).

One of the main outputs of the GCC approach is the typology differentiating producer and buyer-driven commodity chains, i.e. the Fordist model of vertically integrated chains in technology and capital-intensive industries such as motor vehicles, and “novel network forms associated with both the externalization and the internationalization of production in a range of light manufacturing industries”, as the apparel industry (Gibbon, Bair, and Ponte 2008, 320) (cf. Box 2).

#### *Box 2: The GCC typology distinguishing producer- and buyer-driven chains*

(Gereffi 1994) identifies two types of chains: producer- and buyer-driven commodity chains. The former are still vertically integrated and suppliers are affiliated to multinational firms. This means that production activities have been generally offshored but not outsourced. This is the case of complex electronics, car or aircraft industry, i.e. technology- and capital-intensive items. In buyer-driven commodity chains, large retailers, brand-named merchandisers and trading companies work with legally independent firms. Yet, these buyers exert control over their suppliers and dominate the chain. In other words, buyers drive other value chain actors, without necessarily owning them. Buyer-driven chain are prominent in the food, apparel and home goods industries, i.e. relatively simple products, since in the latter “it is relatively easier for lead firms to outsource production”, while in the former “technology and production expertise are core competencies that need to be developed and deployed in-house, or in captive suppliers that can be blocked from sharing with competitors” (Frederick 2016).

Thus, the concept of governance recognizes that “in the contemporary international economy, dynamics of power and control are not necessarily correlated with traditional patterns of ownership”, conversely to “what much of the literature on flexible specialization or post-Fordism has contended” (Bair 2005, 159).

Later on, this typology was judged not able “to capture the range of governance forms observed in actual chains” (Gibbon, Bair, and Ponte 2008). A further typology was developed by (Gereffi, Humphrey, and Sturgeon (2005) that distinguish five value chain governance types (markets, hierarchies, modular, relational, and captive) (cf. Box 3). It specifies “a more elaborate set of governance forms and crucially provides a method to explain *changes* in governance patterns over time”, particularly those that occurred at that time, i.e. the development of outsourcing and the increase in capabilities of suppliers to serve global buyers with technology- and capital-intensive goods (Frederick 2016). With this further typology, the approach was renamed Global value chains.

*Box 3: The five global value chain governance types*

Gereffi, Humphrey, and Sturgeon (2005, 85) differentiate five types of value chain governance, based on three main factors:

- i) Complexity of transactions: “the complexity of information and knowledge transfer required to sustain a particular transaction, particularly with respect to product and process specifications”; whether it is based on price, or one more complex; increase of complexity when lead firms seek just-in-time supply and when they increase product differentiation;
- ii) Ability to codify transactions: “the extent to which this information and knowledge can be codified and, therefore, transmitted efficiently and without transaction-specific investment between the parties to the transaction”; potential to reduce the complexity of information, e.g. development of technical and process standards);
- iii) Capabilities in the supply-base: “the capabilities of actual and potential suppliers in relation to the requirements of the transaction” (e.g. standards).

(Gibbon, Bair, and Ponte 2008, 322–23) describe the five governance types as follows (cf. Figure 19):

- (i) “Market relations are dominant when transactions are easily codified, product specifications are simple and suppliers have the capability to produce without much input from buyers.
- (ii) Modular value chains arise when the ability to codify specifications extends to complex products and when suppliers have the capacity to use generic manufacturing competences to supply full packages and modules, lowering the need for buyers to monitor closely and control design and production processes.
- (iii) Relational value chains arise when product specifications cannot be easily codified, products are complex and supplier capabilities are high; this leads to frequent communication between buyers and suppliers within the framework of a certain degree of mutual dependence, which may be regulated through reputation, social ties and/or spatial proximity.
- (iv) Captive value chains arise when there is ability to codify complex product specifications, but the capability of suppliers is low; this leads to a higher degree of monitoring and intervention by the buyer and to a transactional dependence of the supplier on the buyer.
- (v) Finally, hierarchy occurs when product specifications cannot be codified, products are complex and competent suppliers are not available; as a result, the buyer has to develop design and production skills in-house.

In this framework, as value chains move from market to hierarchy, the level of explicit coordination increases and, with it, power asymmetry between actors.”

(Lee 2010, 2988) summarizes the main focus of the GCC and GVC approaches as threefold: “1) How a global commodity/value chain is organized and who the powerful actors are driving the chain (lead firms); 2) How the way the chain is governed (“governance structure”) affects the distribution of gains across chain participants, that is countries, firms, and workers in developed and developing countries; 3) What determines the movement of chain actors from low to high VA activities (“upgrading”)” .

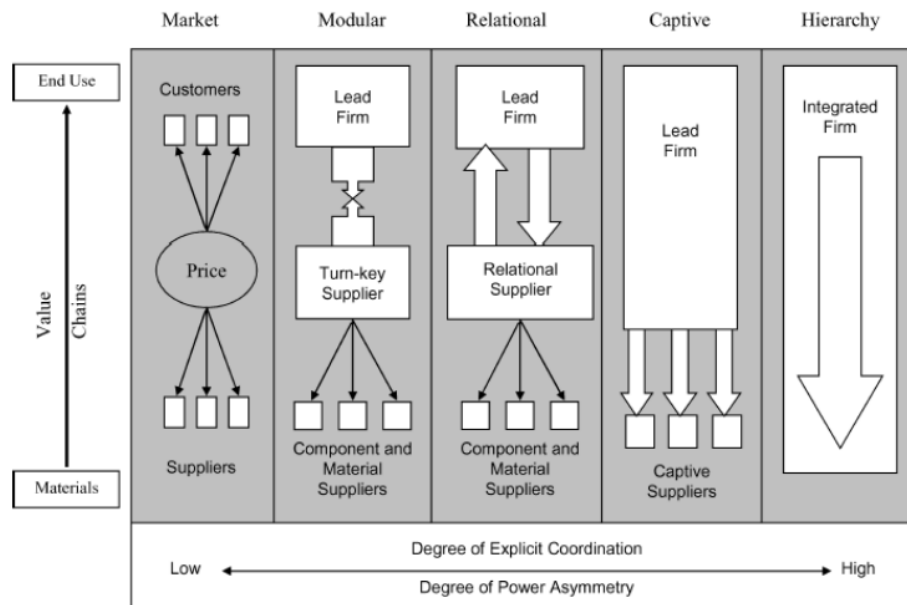


Figure 19: The five global value chain governance types (Gereffi et al. 2005)

### Rationale for using the GCC approach

The GCC/GVC approaches developed within a landscape of other approaches sharing the same focus (product chains), but not the same theoretical background or methodology. Other similar approaches include: “Michael Porter’s (1985) “value chain” concept in management studies, the French “Filières” tradition (Raikes et al. 2000) and the “Commodity systems” approach (Friedland 1984), both from agricultural studies, and “Global production network” (GPN) research (Henderson et al. 2002), used mostly by economic geographer” (Lee 2010, 2988) (cf. Box 4). While some links exist between those approaches, the GCC/GVC approach appeared the most relevant to express the ideas that enacted from the participatory process, particularly those regarding relationships (including power relationships) between value chain actors, which appeared quite central in the participatory process we conducted (cf. the discussion of the results, 5.2).

#### Box 4: GCC/GVC approaches within the landscape of other approaches to analyze product chains

The emphasis of the value chain approach of Michael Porter is on “the sequential and inter-connected structures of economic activities, with each link or element in the chain adding value to the process (value being defined in terms of the pay-off to the business firm)” (Henderson et al. 2002, 439). The focus is mainly on business activities, but there is no attention to corporate power and to institutional context in which firms operated.

The Filière approach allows “to map commodity flows and to identify the agents and activities within the filière”, but the focus is rather on “the technical side of the material flow than [on] the role of social actors [...], making it a “neutral, practical tool to analyze production chains” (Raikes, Jensen, and Ponte 2000, 404).

The Global production networks (GPNs) approach has been developed on the basis of critics raised against the GCCs/GVCs approach: “GPNs strive to go beyond such linearity to incorporate all kinds of network configuration. [...] GCCs/GVCs focus narrowly on the governance of inter-firm transactions while GPNs attempt to encompass all relevant sets of actors and relationships, including intra-firm relationships (Coe, Dicken, and Hess 2008). Thus, the GPNs approach is in theory broader in scope than the GCC/GVC approach, but most of the studies seeking to apply the GPN framework are, “in practice, very similar to those generated using GCC analysis” (Levy (2008), cited by (Coe, Dicken, and Hess 2008, 274)).

GCCs echoes particularly well the rationale underlying the AFN movement, with its focus on balanced and fairer trading relationships. By cutting down intermediaries within supply chains or going through alternative actors, CSAs, farmers' markets, and food co-ops shift away from big buyers (Forssell and Lankoski 2014). Producers and consumers taking part at those chains seek to gain a better control over respectively their outlets and sources of supply, and over transaction modalities. The narrative of the GCCs/GVCs approach is therefore particularly relevant to articulate and tell the values expressed in the P&C list built with the co-researchers, especially those regarding value chain actors and relationships between them (e.g. ownership of organizations, market power, transaction modalities, profitability of value chain actors, distribution of added value between them). The resulting list of C&Is for S-LCA is presented in the results section below (4). After this presentation, we will compare this list with existing S-LCA practice in the food sector in the discussion Section 5.

## 4. Results: The obtained list of C&Is for S-LCA

The C&Is of our S-LCA framework (cf. Table 10 below) places chain governance and relations between VCAs, as drivers of other social sustainability aspects. First are presented the criteria relating to chain governance and relations between VCAs, followed by criteria relating to VCAs, workers, final consumers, and finally to broader societal issues.

### 4.1. *Chain/VCAs governance and relations between VCAs*

The participatory process stresses that food chains should become shorter, more democratic, balanced, and they should be protected against strong competition, in the face of mainstream food chains in which power and control are highly concentrated in few hands (Mooney 2017).

The length of the chain is considered as a key criterion for the sustainability of food chains (C1). It is measured by an indicator, corresponding to the number of intermediaries between the producer of the final product and the final consumers. A short chain is seen as a way to ensure the fairness of exchanges, to develop social ties between primary producers and final consumers and to raise awareness of consumers regarding sustainability issues. The second selected criterion is the ownership of the capital of life cycle organizations, which is seen as a key element in order to keep control of the direction of the organization (C2). To illustrate this concern, one of the retailers of the project has decided to exclude products from its assortment that come from companies quoted on the stock exchange and to favor family businesses. At the same time, control should be shared between VCAs who should be enabled to participate in the decision-making of other VCAs, especially of intermediaries (processors, wholesalers, retailers) (C3). By contributing to the capital of intermediaries' organization, value-chain actors can contribute to important decision-making, but also benefit from potential dividends. If the organization is not owned in majority by its clients or suppliers from the beginning, their shareholding can be promoted and be made easier, provided that the participation to capital is (relatively) open. While not necessarily jeopardizing competition benefits at a larger scale, a controlled management of the competition by the intermediary is considered as a positive practice since it is a way to avoid the buyer to go for the cheapest suppliers (C4). In order to assess this criterion we have chosen to look at whether the intermediary has a policy regarding the selection of suppliers and whether it is committed to specific suppliers, through its status (e.g., producer co-op) or not.

According to GCCs analysts, ownership of organizations is not the only criteria to look at when talking about control. In fact, a VCA can drive other VCAs without necessarily owning them through the market power they have and exert (C5). This market power relies on the level of consolidation of the market (whether a few or a number of organizations hold market shares) and on the size of the organization itself (in comparison to its competitor).

Additionally, more balanced power relations should allow more balanced trading relationships. Transaction modalities have been considered as an important component of sustainability, including commitment between VCAs, and price setting mechanisms.

Commitment between actors of assessed chains is considered as a sustainable practice to ensure a better predictability for suppliers (C6). Having a better visibility over outlets would make the planning of expenses easier, including labor-related costs. In addition, production can be subject to weather hazards, that makes it unpredictable and adds uncertainty. At the same time, such commitment brings constraints to the buyer, since it does not leave the freedom to source from cheaper suppliers. A formal commitment between value-chain actors takes the shape of contracts or membership to a producer cooperative. However, long-term and stable trading relationships can take place without a formal contract, and we propose to look also at the extent to which volumes ordered fluctuate overtime (C7).

Secondly, prices should be set by the seller on the basis of cost price (including the cost of a decent income for all workers), and they should not be negotiated or set by the buyer (C8). As indicators, we propose to look at the above-mentioned elements (i.e., the pricing mechanism), or at the coverage of the cost price by the sale price, if data is accessible. In addition to price fairness for each VCA, there should be a fair distribution of gains between them (C9). Fairness between VCAs can be measured by looking at the distribution of added value per labor unit between VCAs. Finally, other trade practices should be fair, including the payment term, which should not exceed 30 days (C10).

#### **4.2. Value-chain actors**

Good social relationships between value-chain actors have been considered as important by stakeholders (C11), and are measured through the trust in the trading relationship, the recognition of each other's work, and the understanding of each other's difficulties. This choice is quite logical since AFNs and short food chains have been initiated also with the purpose of reconnecting producers and consumers and to exceed pure economic exchanges.

Other major issues raised are the profitability of each VCAs, on which depends the level of income available to partners, including farmers (C12). In Europe, at least on third of farmers has another gainful professional activity besides production to complement their incomes [42], and we consider this element as being a good complementary indicator of farm profitability. The efficiency of processes along the chain is also taken as a sustainability criteria by comparing the cost per functional unit of each process along the chain (C13). The reliance on subsidies and on loans should be minimized for VCAs to keep their autonomy (14) and VCAs should diversify their outputs and outlets (C15).

Table 10. The list of criteria and indicators (C&Is) for S-LCA

	Assessment Criteria	Indicators
Chain governance and relations between VCA		Chain/VCA's governance
	C1. Chain length	Number of intermediaries between the producer and the final user
	C2. Control of organizations	Actual ownership of VCAs
	C3. Participation of other VCAs in decision making	Actual and potential ownership of VCAs by other VCAs
	C4. Competition management	Buying obligations of intermediaries towards certain suppliers
	C5. Market power of organizations	Size of the organization and industry market concentration
		Transaction modalities between VCAs
	C6. Commitment between VCAs	Contract between the buyer and the supplier
	C7. Stability of trading relationship	Fluctuations of ordered volume over time
	C8. Price fairness	Pricing mechanism (price maker, basis) And/or: Cost price (incl. income)/sale price
VCAs	C9. Equity/fairness between VCAs	Distribution of added value between VCAs
	C10. Unfair trade practices	Payment term
	C11. Quality of social ties between VCAs	Trust in the trading relationship Recognition between VCAs Understanding of each other's reality/difficulties
		Profitability and autonomy of VCAs
	C12. Profitability of each VCA	Sole proprietorship: income/living wage; companies: profit $\geq 0$ For farms: use of other gainful activity to complement income
	C13. Efficiency of processes along the chain	Costs of each process along the chain per functional unit
	C14. Reliance on external source of income and funding	Share of subsidies in takings/incomes Share of repayment of a loan in costs/expenses
	C15. Level of diversification (products, outlets)	Share of turnover/revenue brought in by the main product Share of turnover/revenue that comes from the main client/outlet
Workers		Employment conditions
	C16. Social benefits/social security	Provision of good quality contracts to workers (other than partners) Use of "low-cost" worked hours (subsidized contracts, "false" self-employed person, non-paid familial labor, or non-declared)
	C17. Stability of work contracts	Use of unstable contracts/arrangements
	C18. Fair wage	Wage/living wage
		Working conditions
	C19. Working time	Excessive work hours per week Possibility to have weekly days off Possibility to take annual leave
	C20. Safety of work conditions	Use/handling of harmful biological or chemical agents
	C21. Work hardness	Feeling of workers on psychological and physical work hardness Concerns of workers on potential future occupational health problems
		Worker wellbeing
	C22. Participation to decision making	Existence of processes to make workers participate in decisions
Final consumers	C23. Work satisfaction	Feeling of workers on general satisfaction, autonomy, learning, relations with supervisor and colleagues, work recognition, work-life balance, and pay
	C24. Product's accessibility	Satisfaction of consumers regarding product affordability Representation of young, low educated, and low income people among final consumers
	C25. Consumer education	Feeling of consumers regarding the evolution of their awareness on sustainability issues, since they buy the product through the channel Product's quality and transparency
	C26. Food safety	Chemical residues level in the product Or: Trust of consumers on product's safety
	C27. Nutritional quality	Level of nutrients in the product
	C28. Taste	Satisfaction of consumers on taste quality
	C29. Product's transparency	Satisfaction of consumers regarding the information provided on the product and on production methods

Assessment Criteria		Indicators
Broader societal issues	C30. Animal welfare	Sufficient human care
		Access to outdoors
		Limited use of drugs
		Respect of natural life cycle of animals
		Painless end-of-life
	C31. Labor intensiveness of processes	Quantity of working hours/functional unit
	Territorial development	
	C32. Promotion of exchanges between local VCAs	% of working hours occurring in the same region as consumption
	C33. Promotion of local labor	Use of temporary non-resident workers
	Solidarity and reduction of inequalities	
	C34. Contribution to public expenses	% of price to tax payment and social contributions
	C35. Reflection of all costs in price	True price (including social (and environmental) costs)/sale price
	Food sovereignty and heritage	
	C36. Contribution to local food needs	% of output for food purpose
		% of output for local markets
	C37. Conservation of heritage and know-hows, incl. agricultural	Indicator not found
	C38. Support to peasant and small-scale production methods and to autonomous farms	Indicator not found

*Note: VCA stands for value chain actors.*

### 4.3. Workers

In regards to workers, VCAs should provide fair employment conditions, including compliant contracts with full social benefits (i.e., employee contracts) and stable contracts. They should avoid the use of daily contracts, non-paid family labor, and non-declared labor (C16 and C17), and workers should be paid with a fair wage (i.e., a wage exceeding the country's living wage (C18)). The working time should not exceed weekly statutory working time and workers should have weekly and yearly days off (C19). Working conditions should be safe, meaning that the handling of harmful inputs should be banned (C20). Work hardness is assessed through the feeling of workers in terms of physical and psychological hardness and their concerns regarding potential future occupational health problems (C21). Finally, workers should participate in the decision making of organizations (C22) and workers should be satisfied with their work (C23). On this latter criteria, workers are asked how they feel about various work-related aspects: autonomy, learning, internal and external rewards, work–life balance, and salary.

### 4.4. Consumers

According to the sustainability definition, quality (i.e., food safety, nutritional and taste quality), transparency, and affordability of products have been judged as important criteria. Regarding product's accessibility (C24), we propose two indicators: The first one looks at the satisfaction of consumers regarding the affordability of products, and the second one looks at how vulnerable people are represented among the sample of consumers of the product, in comparison to their representation among the population.

Criteria relating to product's quality and transparency are assessed through the satisfaction or trust of consumers regarding these aspects, apart from the nutritional quality for which the level of nutrients in products should be measured (C26–C29).

Finally, the awareness of consumers regarding sustainability issues should be raised, through their participation in product chains. For this criteria, we propose to ask consumers to auto-evaluate whether they feel more educated/informed when they buy products through the respective alternative product chains (C25).



#### **4.5. Broader societal issues or issues not related to any particular stakeholders**

The last category does not relate to a specific stakeholder but gathers issues that are of general or common interest. In this category, we find criteria concerning territorial development, food sovereignty and conservation of heritage, and animal welfare.

Criteria covering animal welfare include the need for sufficient human care for herds, access to outdoors, limited use of drugs including curative treatment and hormones, respect of natural life cycles of animals, and the need to limit pain at end-of-life (C30).

Product life cycles involving processes with high labor intensiveness are considered as positive since it is a way to provide jobs to people (C31). This criterion can be measured with the quantity of working hours per functional unit. Additionally, collaborations between local VCAs are promoted, meaning that product life cycles with processes taking place at the same place are favored (C32). This criterion can be measured by looking at the percentage of working hours that takes place in the same region as consumption. In the same vein, local labor is promoted and VCAs should avoid hiring non-resident workers since these workers are often hired with contracts of their country of origin and do not benefit from local social benefits, as posted workers are in the European Union (C33). Finally, VCAs should contribute to public expenses by paying regular taxes and social contributions and not engage in tax optimization, nor tax evasion (C34). For this criterion, the indicator corresponds to the percentage of price that goes to tax payment and social contribution, the higher being seen as the better. Ideally, the sale price should also take into account all the social (and environmental) costs induced by the product life cycle, so that products with a more detrimental effects on the planet and on people should be more expensive, and thus less consumed, following the LCA Eco-social cost concept (Croes and Vermeulen 2015) (C35).

Organization of the product life cycle should promote food sovereignty, meaning that their output should go in priority for food purpose (and not e.g., fuel) and for local markets (C36). Also, product life cycle should valorize local and traditional know-how and small-scale, autonomous, and peasant farms should be supported, but for these criteria, relevant indicators could not be found (C37).

### **5. Discussion**

In this section, we discuss on one hand the results obtained in terms of C&Is configuration (Section 5.2) and on the other hand the process to build the list itself (Section 5.3). The first sub-section describes the materials and methods used for those both exercises.

#### **5.1. Materials and methods**

In order to discuss the list of C&Is obtained to conduct S-LCA, we compare our list of C&Is with 16 S-LCA studies that we selected on the basis of the following criteria: The product is for food purpose or is agricultural (the destination is not specified), the study proposes a list of C&Is that has been obviously applied to a case study, and the list is structured by stakeholder category or is easily comparable (excluding thus studies with no indicators, type II studies (which use, generally, not more than two indicators), and studies on biofuels products). Among the 16 reviewed studies, 14 take the Guidelines for S-LCA as primary reference. As already mentioned, some of these studies consulted stakeholders; however, rather to select or validate C&Is *from an existing framework* (i.e., the Guidelines for S-LCA), than to select C&Is *from scratch* (Delcour et al. 2014; Nemarumane and Mbohwa 2015; Tecco et al. 2016; Revéret, Couture, and Parent 2015). Additionally, when consulted, stakeholders tend to be from mainstream value chains, since performances or potential impacts of conventional sectors are assessed

(e.g., Canadian milk industry, sugar industry in South Africa). One study consulted other actors, such as experts (De Luca et al. 2015b). About half of the studies focus on primary production and processing (including input production for some of them), while another half has a broader system boundary and includes consumption. Thus, our study differs from reviewed studies by the way C&Is were selected, by the product chains assessed (local alternative food chains), and by the processes included in the assessment perimeter (primary production to consumption), with all that having implications on the consulted stakeholders (whenever they were consulted). Because our research question focuses on what should be assessed in a sustainability assessment of AFNs, and not on how respective criteria should be assessed, the subsequent comparative analysis focuses on assessment criteria, and not on indicators. Given the importance of studies using the subcategories/criteria of the Guidelines for S-LCA as a basis, and our objective being to feed in the discussion on the revision of the Guidelines, the following discussion uses the list of subcategories/criteria from the Guidelines for S-LCA as a framework to structure the discussion.

More prosaically, in order to discuss the process (Section 5.2) of building the list of C&Is, we collected the individual feedback of the co-researchers on the learning acquired during the process of co-defining a sustainable food system. Further, we analyzed the process and sought to identify the limits and the requirements of such an approach, in order to draw lessons for other applications.

## ***5.2. Discussing the results; or, a list of criteria and indicators for S-LCA***

In order to discuss the list of C&Is for S-LCA, we look for convergences and divergences. In other words, we seek to interpret the result of our work, with the support of the state of art. As a basis for the discussion, table 11 gathers criteria included in our list and the ones used by other S-LCA food studies, structured according to the subcategories proposed by the Guidelines for S-LCA (Benoît and Mazijn 2009).

In terms of stakeholder categories, our list focuses primarily on “VCAs” (including relations between VCAs) and on “worker”, and to a lesser extent on “final consumers”, “local community”, and “society”. This is a first divergence with the reviewed studies, which focus primarily on the stakeholder categories “worker” and “local community”, followed by “final consumers”, “VCAs”, and “society”, as already highlighted (R. Wu, Yang, and Chen 2014).

Another divergence with reviewed studies is the centrality given to criteria relating to VCAs, which count 15 criteria. In our framework, we propose to distinguish criteria linked to *chain/VCAs governance and relations between VCAs* (e.g., price fairness) and criteria linked to *VCAs themselves* (e.g., VCA’s profitability). Currently, there is as yet in the Guidelines no subcategories relating to VCAs themselves, and included subcategories (fair competition, social responsibility, relations with suppliers and respect of intellectual property) belong rather to the former since it regards the behavior of VCAs regarding other VCAs (generally supplier and competitors).

Table 11: Comparison assessment criteria/subcategories in food and agricultural S-LCA studies

	Subcategories/Criteria	Studies Using It
Chain/VCA's governance and relations between VCA	From the Guidelines	
	Fair competition	[28,46–48]*, C1
	Supplier relationships	[46,47,49], C6, C7, C11
	Promoting social responsibility	[28,46,47,49,50]
	Intellectual property rights	[28,47]
	From other studies	
	Fairness/equality of the transaction	[25,28,48,51], C8, C10
	Responsible supplier practices	[28]
	Bargaining power/participation in decisions/	[27], C3
	Ownership	[48] C2, C3
	Chain length	C1
	Competition management	C4
VCAs	From other studies	
	Efficiency of processes along the chain/costs	[44,48], C13
	Contribution of product/process to income	[48]
	Accessibility of the industry for a worker	[48]
	Profitability of each VCA	[44], C12
	Reliance on external source of incomes and funding	[52], C14
	Level of diversification (products, outlets)	C15
	Quality of social ties between VCAs	C11
Workers	From the Guidelines	
	Freedom of association and collective bargaining	[26,28,47,48,51–55]
	Child labor	[28,48,51–55]
	Fair salary	[26–28,46–48,52–55], C18
	Working hours	[25,28,47,48,51–54], C19
	Forced labor	[28,48,52–54]
	Equal opportunities/discrimination	[26–28,44,46–48,52–54,56]
	Health and safety	[25,26,28,44,46–48,50–55], C20
	Social benefits/security	[28,46–48,51–55], C16
	From other studies	
	Compliance with labor laws/contracts/illegal workers	[28,44,52,53]
	Seasonal and migrant workers	[47]
	Stability of work contracts/employment insecurity	[25,28,44], C17
	Work hardness/working conditions	[27,51], C21
	Participation to decision making	[27], C22
	Professional accomplishment/growth/development	[28,46,49]
	Age/education of employees	[25,49,56]
	Work satisfaction	[27], C23
Final consumers	From the Guidelines	
	Health and safety	[47,48,50,52,54,55], C26, C27
	Feedback mechanism	[47,52,54,55]
	Consumer privacy	[46,54,55]
	Transparency	[46–48,52,54,55], C29
	End-of-life responsibility	[46,47,54,55]
	From other studies	
	Consumer education	[54,56], C25
	Taste/satisfaction with product	C28
	Affordability and accessibility	C24
Local community	From the Guidelines	
	Access to material resources	[44,46,52,53,55]
	Access to immaterial resources	[44,46,52,53,55]
	Delocalization and migration	[28,46,47,52,55]
	Cultural heritage	[52,55], C37
	Safe and healthy living conditions	[28,46,52,53,55]
	Respect of indigenous rights	[28,47,52,53,55]
	Community engagement	[28,46,47,55]
	Local employment	[25,46–48,50,55,56], C33

Society	Secure living conditions	[47,55]
	From other studies	
	Area reputation	[44,46]
	Cohabitation	[47]
	Level of globalization of the value chain/promotion of exchanges between local VCAs	[48], C32
	Natural and built heritage	[27,28]
	Agro-environmental practices/environmental management	[28,47]
	Protection of small-holder family farming	[27] (C38)
	Contribution to local food needs	C36
	From the Guidelines	
	Public commitments to sustainability issues	[28,46,47,56]
	Contribution to economic development	[28,44,46–48,56]
	Prevention and mitigation of armed conflicts	[52]
	Technology development	[28,46,47]
	Corruption	[28,47]
	From other studies	
	Labor intensiveness of processes	[44], C31
	Contribution to public expenses	[28,44], C34
	Transparency	[28]
	Animal welfare	[28,47,52], C30
	Reflection of all costs in prices	C35

\* cf. Table 13 in Supplementary material 5 of this chapter for the correspondence table

### 5.2.1. The centrality of relations between VCAs/chain governance

This comparison highlights the lack of attention being paid to criteria qualifying the relations between VCAs. Yet, the accompanying methodological sheets of the Guidelines for S-LCA state clearly that practices of the lead firm towards its suppliers may influence social conditions in supply chains, positively in the case of a deep engagement towards suppliers, or negatively in the case of, for example, “tight purchasing deadlines and low pricing policies” (Benoît et al. 2013). These indicators seem a good basis to consider these aspects in S-LCA, even though they are designed for big companies and do not fit every context (Arcese, Lucchetti, and Massa 2017).

From over 14 studies applying the Guidelines, only four actually include one or more of the Guidelines’ subcategories (Revéret, Couture, and Parent 2015; Arcese, Lucchetti, and Massa 2017; Deloitte 2016; Chen and Holden 2016). One reason to that could be that currently S-LCA practice focuses on practices of each VCA regarding other stakeholders (e.g. employment and working conditions), these issues being often considered to be the main social problems in product chains, but does not include potential explanatory factors or causes of such social problems (cf. chapter 4), such as trading practices between actors of the chain, since it is mainly a reporting tool (Feschet 2014). Yet, including stressors of social impacts could be a way to improve our understanding of mechanisms that lead to negative social impacts in product chains (e.g., indecent working conditions), and to identify improvement levers (Sureau et al. 2017; chapter 1).

While confirming the relevance of two of the Guidelines’ subcategories (fair competition and supplier relationships), our list of C&Is suggests additional criteria, which are confirmed by other studies: price fairness (Kruse et al. 2008) and the distribution of added value (Delcour et al. 2014; Revéret, Couture, and Parent 2015; Kruse et al. 2008; Bouzid and Padilla 2014); possibility for value-chain actors to participate in decisions and effective bargaining power (Tecco et al. 2016); market power or industry concentration (Kruse et al. 2008). Some other of our criteria are unusual and are to be linked to the alternativeness of the consulted stakeholders: chain length (the shorter the chain, the better) and

competition management (competition should be limited and promote complementarities). This last criterion even conflicts with the subcategory on fair competition that is about preventing “anti-competitive behavior”.

This “radicalness” in our C&Is is more visible when looking at indicators and corresponding reference points: Pricing mechanisms should be in favor of those producing the good—the suppliers; competition should be managed and actually minimized; there must be a commitment between VCAs, other VCAs should participate in decisions of intermediaries, etc. Globally our criteria seem to be more prescriptive for VCAs than the ones proposed by the Guidelines or other studies, with ambitious basic requirements that reminds the tone of the Guidelines’ subcategories relating to workers.

### **5.2.2. The Introduction of criteria informing on the situation of VCAs themselves**

Contrary to the Guidelines for S-LCA, our framework and some other studies propose criteria reflecting the situation of VCAs. Some criteria have a direct link with the product life cycle: efficiency/cost of processes (as proposed in our list) and contribution of the process/product to VCAs income (Revéret, Couture, and Parent 2015; Kruse et al. 2008). For some others, the link to the product life cycle is less obvious: profitability (De Luca et al. 2015b), reliance on external incomes and funding (Neugebauer, Bach, et al. 2014), and accessibility of the industry for a worker/a VCA (Kruse et al. 2008). Two less usual criteria that we propose focus on autonomy of VCAs (level of diversification in terms of output and outlets) and on the quality of their social ties with other VCAs.

We may ask why such criteria are not in the Guidelines (and neither in the Product social metrics, the other main framework for S-LCA). The list of subcategories of the Guidelines reflects practices/behaviors of life-cycle VCAs towards other stakeholders (other VCAs (suppliers, competitors), workers, final consumers, etc.). The five stakeholders included correspond to stakeholders which are impacted by behaviors of VCAs and the subcategories reflect practices/behaviors of VCAs towards these stakeholders. Thus, it is logical not to have subcategories reflecting the situation of VCAs (e.g., the economic situation) and only subcategories reflecting behaviors. However, if the situation of VCAs themselves (e.g., their profitability) is overlooked, we might miss some information that could help understand the behavior of those VCAs (e.g., towards their workers or the employment conditions they provide, or towards final consumers or the product’s safety and quality).

Additionally, this choice of excluding the situation of VCAs from assessed criteria leads to odd situations where studies look at the working conditions of farm workers, but not of farmers. It has to be noted that in the new version of the Product social metrics (Goedkoop, M.J., Indrane, D., and de Beer, I.M 2018), there is a new stakeholder category for “small-scale entrepreneurs”, which is a step in the right direction to have a more comprehensive picture, but which highlights the oddity included in this framework: Why not a stakeholder category VCAs, including small-scale and large-scale companies?

### **5.2.3. More ambitious criteria for workers**

Our participatory process gives importance to worker-related criteria, so do other reviewed studies. However, our criteria do not touch upon all basic subcategories of the Guidelines (such as child or forced labor, which are issues that are supposed to be absent in the assessed product chains), but upon more ambitious criteria (stability of work contracts, participation to decision making, work hardness, and satisfaction). It could be worth expanding the list of the Guidelines in this sense, as S-LCA practice suggests also.

#### **5.2.4. For final consumers, more basic criteria, and adapted to any product chains**

On final consumers, our proposition is congruent with S-LCA practice: Most studies assess health and safety as well as transparency, while feedback mechanisms, consumer privacy, and end-of-life responsibility are barely used by other reviewed studies. These three later subcategories seem actually to be tailored to big companies, and might not be relevant for most product chains. Our list stands out from other studies with new criteria on accessibility and product's taste, while our choice for consumer education is also confirmed by two other studies (Ramirez et al. 2014; Vinyes et al. 2012).

#### **5.2.5. A certain divergence on local community and society-related criteria**

On local communities and society, we observe a rather structural divergence, since the Guidelines' subcategories—which are extensively used by the reviewed studies—are not in our list, except for two of them (out of 14) (cultural heritage and local employment). The six additional criteria we propose are barely used by other studies and might again show a certain radicalness: Level of globalization of the chain/exchange between local VCAs (Kruse et al. 2008), reflection of all social (and environmental) costs in the price, contribution to local food needs/to food sovereignty, labor intensiveness of processes (De Luca et al. 2015a), animal welfare (Revéret, Couture, and Parent 2015; Deloitte 2016; Neugebauer, Bach, et al. 2014), and contribution to public expenses. This latter criterion has not been found in any of the reviewed studies while paying taxes is presumably the first duty of an organization towards society, and the first step to contribute positively to the wellbeing of people and the common good.

### ***5.3. Discussion on the process to build the list of criteria and indicators***

In this subsection, we look at the contributions by the stakeholders involved in the configuration of the C&Is frame with our participatory approach; subsequently, the limits and implications of adopting such an approach are also addressed on the basis of our experience.

#### **5.3.1. Contributions**

As expressed by the co-researchers involved in the co-creation process (the retailers/facilitators of the AFNs), they experienced three kinds of learnings. The first one is the impact on their **understanding of sustainability issues** and of sustainability in general and on their ability to express their views analytically. By facing the points of views of others, one participant expressed that she could better structure her ideas on sustainability. One other participant claimed that his view on sustainability expanded during the process, from a view limited to environmental issues, to integrate also social, economic, and territorial sustainability issues.

Building such a list apparently gave the opportunity for a wider set of stakeholders and participants to exchange their knowledge, beliefs, and point of views. Thus, it was also a way to **facilitate dialogue** between value-chain actors who usually do not have the opportunity to speak to each other and to stimulate reflection and understanding on each other's own practices and ways of functioning.

Finally, another participant expressed that the learning was about how to work together and how to behave with others, rather than “scientific knowledge”, and how to **build knowledge collectively**.

#### **5.3.2. Limits and implications/requirements**

Next to these rather straightforward claimed benefits, the process of building a list of C&Is within a participatory action-research project entails a number of limits and implications that could hamper its wider and general application. Firstly, it requires time, available funding for academic researchers and

field co-researchers, and the availability of a relatively wide set of chain actors to participate in the consultations. Within our project, the process itself lasted nearly one and a half years.

#### **From the consultation/co-creation process to the assessment tool**

As put forward earlier, the issue of the sample to be consulted is very important since the entire *raison d'être* of participation and co-creation is about taking influence on results. Included criteria rely on interests and knowledge of participants consulted. In our case, it resulted in a list of criteria directed towards farms (i.e., primary production actors). The sample should be sufficiently broad to include actors from all life cycle phases, otherwise some issues within the system could be neglected, as we noticed in our case. In the latter case, further work can be done by academic researchers to address potential shortcomings; however, there is a risk for the result of the participatory process to be altered.

The questions to be asked to participants must be clearly defined and comprehensively communicated to the participants, otherwise the obtained results could differ from what has been expected. In our case we had to adapt the list of criteria since the participatory process was used to build two different tools (the reported C&Is for S-LCA, and a self-assessment tool for distribution systems and supply chains) with different scopes, so a substantial work of reformulation and criteria adaptation was done to criteria to fit all life cycle phases. If the participatory process would have targeted a single use, the results would have been more tailored towards the configuration of a particular highly contextualized assessment tool. However, an obvious limitation of our process expectations, in particular with respect to future repetitions of the exercise, is the particular situation of having resources to allow for three field partners to engage thoroughly in a three-year research project in order to co-create an assessment tool that they could actually hardly implement by themselves.

#### **The framework to articulate C&I**

The use of a framework like PC&Is or of a conceptual framework like the three-pillars approach to sustainability can be useful to structure ideas, but such a framework can be hard to be combined with a participatory process, since it can restrict and preconfigure the expression of ideas or bring confusion. At the very early stages of the process, academic researchers put forward the three-pillars approach to sustainability, but this framework was rejected by co-researchers who felt it brought a superficial partitioning that was not able to account transversal issues properly. However, from the beginning there was an impression shared by researchers from academia that a conceptual or theoretical framework was needed to frame the process. In order to finalize the list of C&Is for S-LCA, the chosen theoretical framework (Global commodity chain) was introduced later in the process, when the participatory process was actually already completed, in a near-to post-production phase.

#### **The multidisciplinary approach required**

The multidisciplinary approach required by the participatory process (as highlighted by (Mathe 2014)) can indeed be an impediment, as can be illustrated by the criteria identified for which indicators could not be found or by criteria which could not be assessed (cf. part two of this article (Sureau et al. 2019a); chapter 6). But the participatory process necessarily implies the participation of actors with various knowledge bases which actually facilitated the process in our case, including the building of indicators.

#### **Usability of results**

A limit that is often raised in literature, and which is also quite inherent in strong contextualized participation, is the relative impossibility to use the results straightforwardly in other contexts or even to compare results between studies. This is clearly a potential main limit of participatory processes

conducted at local level, such as the one we implemented. However, the absolute non-relevance and non-applicability of a list such as ours to other similar contexts would still need to be proven; in particular as the context of the exercise (i.e., European, urban, co-creational...) is not necessarily particular in itself, but can be found in some other situations. In the same vein, we feel that such a process is a good way to help the consolidation of the list of subcategories of the more generic S-LCA Guidelines, notably because it can help give ground to the work of the task force that led to the Guidelines' list of subcategories, and eventually streamline the S-LCA practice.

## 6. Conclusions

The participatory approach has been implemented to give the floor to actors or people who are active in the food sector of a specific region and who are hardly heard, as well as to build a meaningful list of C&Is for S-LCA. The result of the implementation of this approach proves that it is relevant, since the resulting list of assessment C&Is is substantially different from what is proposed and done more generally in S-LCA. The radicalness of AFNs' chain actors is reflected in the ambitious and innovative criteria proposed, particularly on the functioning and governance of product chains, as well as on the situation of VCAs themselves, which can be considered as potential explanations of positive and negative performances along the chain. In this sense, our list stands out from other lists, which aim at describing and reporting on social performances and hotspots in product chains, but not at investigating potential underlying root causes.

For further S-LCA studies and in the framework of the revision of the Guidelines' subcategories, we argue, on the basis of this work, that criteria relating to VCAs themselves, to chain governance, and to relations between VCAs (including economic relations; i.e., transaction modalities) should be added.

Our list also rejects—in a way—the relevance of some of the subcategories proposed by the Guidelines to our specific context, such as those adapted to big companies only (e.g., feedback mechanisms, public commitment to sustainability issues) and those which are not directly related to the product life cycle, such as some of the subcategories of the local community stakeholder category.

However, a main recommendation for further S-LCA research is to replicate such a participatory process to build assessment criteria with field actors at the local level, including chain actors, as a way to continue the discussion on the richness of what S-LCA should assess. Such discussion could also feed the content of existing and future labelling initiatives (i.e., their specifications), which, apart from a few exceptions such as participatory guarantee systems (IFOAM Organics International n.d.), are built following a rather top-down approach and often face shortcomings on social and socioeconomic issues.



## Supplementary material 4

### *Le processus de participation pour construire la liste de principes et critères : entre co-création et consultation*

Le processus participatif mis en place pour dresser la liste des critères de durabilité des systèmes alimentaires alternatifs est avant tout de nature *itérative*. En ce sens, les résultats intermédiaires obtenus sont successivement réalimentés par les réflexions subséquentes. Ce dialogue permanent entre les différentes listes a permis de faire avancer la construction de la liste finale en prenant, à chaque étape, en considération les inputs des parties prenantes.

La *première étape* a été un brainstorming réalisé par chaque partenaire du projet (i.e. les représentants du maillon distribution de chaque système) sur leurs pratiques et objectifs en termes de durabilité. Ce brainstorming a été ensuite organisé selon les piliers du développement durable afin de structurer la pensée et de pouvoir mettre les idées de chaque partenaire les unes à côté des autres et réaliser des recoupements. Ces brainstormings ont mobilisé les membres actifs des partenaires au sein de CosyFood ; ce sont donc des travaux en groupes restreints. En parallèle, l'IGEAT s'est chargé de réaliser une revue de littérature des critères qui apparaissent généralement dans le traitement de la durabilité des systèmes alimentaires.

La *deuxième étape* a été de traduire toutes ces idées en Principes et Critères énoncés plus clairement. Nous avons dû ainsi nous approprier le cadre Principes, Critères et Indicateurs.

Suite à ce travail, un nouveau travail de comparaison et de recoupement a été effectué pour obtenir une première liste de Principes « partagés ». Nous avons avalisé cette liste lors d'un LivingLab (i.e. une réunion de travail entre tous les partenaires du projet). Cette première liste « intermédiaire » devait servir de base à la consultation des consommateurs, producteurs et acteurs de terrain engagés dans les systèmes alimentaires partenaires. Cette *troisième étape* a donc abouti à un résultat-produit plus figé, circonscrit et clair, afin de le soumettre à feedback au sein de chaque système.

La *quatrième étape* a été la récolte des données-informations au sein de chaque système. Chaque partenaire a organisé une consultation large des consommateurs et employés/bénévoles sur base de notre première liste de principes et critères. Le déroulement de cette consultation a été le même chez chaque partenaire. L'idée était d'obtenir un feedback sur le contenu de notre liste, de la soumettre au savoir et aux connaissances des personnes qui sont membres des circuits alimentaires travaillant avec CosyFood. La quantité d'informations, d'avis et d'arguments obtenus est extrêmement riche.

La *cinquième étape* fut le traitement de toutes ces informations. Après un listing exhaustif de tout ce qui a été récolté pendant ces consultations, un véritable travail de co-création pour l'analyse de ces données s'est effectué par binôme de chercheurs. En partant de la première liste, le traitement des avis récoltés a permis d'identifier les critères pertinents, les critères problématiques ou encore d'ajouter un certain nombre de critères. Les consultations ont également mis à jour la nécessité de réfléchir à une autre arborescence que celle des piliers du développement durable, conservées depuis l'entame du projet.

La *sixième étape* a été réalisée par le groupe de co-chercheurs en entier lors de deux ateliers de co-création qui ont servis à résoudre les problèmes au niveau des critères énoncés. Les problèmes de fonds ont été identifiés en priorité afin de tenter de les résoudre. Seuls deux critères n'ont pas trouvé de

solution satisfaisant les expertises de chacun. Néanmoins, la liste obtenue suite à ce travail peut être considérée comme une liste pratiquement « finale ».

La septième étape a été la consultation des acteurs des chaînes de valeur (grossistes, transformateurs, producteurs primaires), qui travaillent avec chacun des partenaires. Le modèle de discussion avec ces acteurs de terrain était identique à celui utilisé pour les discussions avec les consommateurs, moyennant quelques aménagements.

Une fois les discussions menées, toutes les réflexions ont été retranscrites et centralisées dans un seul document de travail (feuille Excel). Le travail d'analyse de ces informations a été réalisé par des binômes de co-chercheurs. Il s'agissait de comparer les avis et réflexions ayant émergé au sein des trois systèmes partenaires et d'évaluer en quoi et comment le contenu des principes et critères pouvaient en être validé ou transformé, voire si des reformulations étaient nécessaires. Chaque binôme ayant traité la liste complète, la dernière paire de co-chercheurs a fait une proposition de modifications tenant compte des analyses des deux autres binômes.

Cette proposition a servi de base à la dernière étape de ce processus, consacrée à la validation « définitive » de la liste de principes et critères. Cette validation s'est faite par consentement lors d'un LivingLab faisant intervenir tous les partenaires du projet. Cette validation était absolument nécessaire pour entrer dans l'opérationnalisation de la liste, à savoir l'identification des indicateurs qui devront être mesurés afin d'évaluer les critères.

Source: Cosy-Food Project, 2016 and 2017 reports.

## Supplementary material 5

Table 12. Intermediary list of sustainability principles and corresponding criteria (P&C list, from step 3).

Principles	Associated Criteria
<b>1. Fair trading practices</b>	Terms of trade and balanced relationship between VCAs; added value distribution; number and role of intermediaries; fair competition; competition management based on complementarities; prices reflect economic, environmental, and social costs; cooperative management and participation of stakeholder to decision making
<b>2. Economic viability of VCAs</b>	Commitment between VCAs and stability of income/takings; profitability of VCAs; efficiency of processes along the chain
<b>3. VCAs autonomy and resilience</b>	Reliance on subsidies; reliance on external funding/on debt; diversification and innovation
<b>4. Decent work conditions and worker wellbeing</b>	Respect of labor legislation, including on equal opportunities; living and legal wage; income fairness between workers; distribution of added value between VCAs; work contract stability; physical and psychological work hardness; work satisfaction; match between tasks, skills, and interests of workers; participation of workers to organization's decision making; accessibility to practice the profession
<b>5. Territorial development</b>	Job creation; use of local labor; geographical scale of trade/relocation of trade and collaboration between economics actors
<b>6. Solidarity, social ties and participation</b>	Promotion of interaction between chain actors; support to collaboration between producers; accessibility of products to any consumer; recognition of the work of suppliers by consumers; involvement and commitment of consumers in the system
<b>7. Economic and financial transparency</b>	Compliance to tax return and contribution to public expenses; use of formal/regular/declared work/labor only
<b>8. Product's quality, consumer and producer health</b>	Transparency on production methods; level of traceability; use of harmful inputs; healthy products, free of residues; nutritional and taste quality
<b>9. Awareness raising and practices improvement</b>	Promotion of awareness raising of consumers to sustainability issues; provision of information by the system on health, environmental, social and economic implications of consumption choices; promotion of continuous improvement and revaluation of practices, including farming practices; number of intermediaries
<b>10. Conservation of cultural heritage and know-how</b>	Valorization of local and traditional know-hows, and their handover; support to peasant- and small-scale production methods; support to autonomous farms
<b>11. Food sovereignty</b>	Contribution to local food needs; promotion of diversification to meet basic nutritional needs of people
<b>12. Respect of animal welfare</b>	Match between herd size and number of workers; ban on battery farming; curative treatment not used as preventative treatment and preventative treatment are only natural; ban on hormone use; respect of natural life cycle of animals; painless end-of-life
<b>13. Respect, conservation and regeneration of nature</b>	Water management; minimization of air and water pollution; ban on synthetic chemical treatment; plant protection methods based on positive interaction between plants, predators and on development of organic life of soils; regenerative farming practices; use of land that matches geographical and geological characteristics; minimization of soil erosion; respect of the productive function of the soil, including humus and organic matter regeneration, mineralization, and soil structure
<b>14. Conservation of biodiversity</b>	Ban on genetically-modified organisms (GMOs); conservation and regeneration of biodiversity and of local native and hardy species
<b>15. Reduction of energy footprint</b>	Optimization of logistics; promotion of soft mobility; reliance to fossil energy; use of renewable energy; promotion of local and seasonal inputs and products
<b>16. Circularity of resources flows along the chain</b>	Limitation of food waste; limitation of waste, including packaging used and produced; reuse and recycling of waste; circularity of waste flows and their use in the system

Table 13: Correspondence number-article for table 11

Number	Article
25	Delcour, A.; Decruyenaere, V.; Goffart, J.-P.; Stappen, F.V.; Lories, A.; Burny, P.; Rabier, F.; Stilmant, D. ASCV comparative des filières céréalières en Wallonie (Belgique). In <i>Proceedings of the Social LCA in Progress—Pre-Proceedings</i> , Montpellier, France, 19 November 2014.
26	Nemarumane, T.M.; Mbohwa, C. Social Life Cycle Assessment in the South African Sugar Industry: Issues and Views. In <i>Social Life Cycle Assessment</i> ; Muthu, S.S., Ed.; Environmental Footprints and Eco-design of Products and Processes; Springer: Singapore, 2015; pp. 71–113. ISBN 978-981-287-295-1.
27	Tecco, N.; Baudino, C.; Girgenti, V.; Peano, C. Innovation strategies in a fruit growers association impacts assessment by using combined LCA and s-LCA methodologies. <i>Sci. Total Environ.</i> <b>2016</b> , <i>568</i> , 253–262.
28	Revéret, J.-P.; Couture, J.-M.; Parent, J. Socioeconomic LCA of Milk Production in Canada. In <i>Social Life Cycle Assessment</i> ; Muthu, S.S., Ed.; Environmental Footprints and Eco-design of Products and Processes; Springer: Singapore, 2015; pp. 25–69. ISBN 978-981-287-295-1.
44	De Luca, A.I.; Iofrida, N.; Strano, A.; Falcone, G.; Gulisano, G. Social life cycle assessment and participatory approaches: A methodological proposal applied to citrus farming in Southern Italy. <i>Integr. Environ. Assess. Manag.</i> <b>2015</b> , <i>11</i> , 383–396.
46	Arcese, G.; Lucchetti, M.C.; Massa, I. Modeling Social Life Cycle Assessment framework for the Italian wine sector. <i>J. Clean. Prod.</i> <b>2017</b> , <i>140</i> , 1027–1036.
47	Deloitte. <i>National Beef Sustainability Assessment—Environmental and Social Life Cycle Assessments</i> ; Canadian Roundtable for Sustainable Beef: Calgary, AB, Canada, 2016.
48	Kruse, S.A.; Flysjö, A.; Kasperczyk, N.; Scholz, A.J. Socioeconomic indicators as a complement to life cycle assessment—an application to salmon production systems. <i>Int. J. Life Cycle Assess.</i> <b>2008</b> , <i>14</i> , 8–18.
49	Chen, W.; Holden, N.M. Social life cycle assessment of average Irish dairy farm. <i>Int. J. Life Cycle Assess.</i> <b>2016</b> , <i>22</i> , 1459–1472.
50	Busset, G.; Sablayrolles, C.; Montréjaud-Vignoles, M.; Belaud, J.-P. Integration of Social LCA with Sustainability LCA: A Case Study on Virgin Olive Oil Production. <i>Proceedings of the 4th International Seminar on Social LCA</i> , Montpellier, France, 19–21 November 2014; CIRAD: Montpellier, France, 2014.
51	Bouزيد, A.; Padilla, M. Analysis of social performance of the industrial tomatoes food chain in Algeria. <i>New Medit</i> <b>2014</b> , <i>13</i> , 60–65.
52	Neugebauer, S.; Bach, V.; Finkbeiner, M.; Fischer, D. Social Indicators for Meat Production—Addressing Workers, Local Communities, Consumers and Animals. In <i>Proceedings of the 9th International Conference LCA of Food</i> , San Francisco, CA, USA, 8–10 October 2014.
53	Benoît, C.; Aulisio, D.; Niederman, G.V.; Overaker, S.; Hallisey-Kepka, C.; Tamblyn, N.; Norris, G.A. <i>Social Scoping Prototype—Report Product Category 2-Orange Juice</i> ; New Earth: New York, NY, USA, 2012.
54	Ramirez, P.K.S.; Petti, L.; Ugaya, C.M.L. Subcategory Assessment Method for Social LCA: A First Application on the Wine Sector. In <i>Pathways to Environmental Sustainability</i> ; Salomone, R., Saija, G., Eds.; Springer International Publishing: Berlin, Germany, 2014; pp. 107–116, ISBN 978-3-319-03825-4.
55	Petti, L.; Ramirez, P.K.S.; Traverso, M.; Ugaya, C.M.L. An Italian tomato “Cuore di Bue” case study: Challenges and benefits using subcategory assessment method for social life cycle assessment. <i>Int. J. Life Cycle Assess.</i> <b>2016</b> , <i>23</i> , 569–580.
56	Vinyes, E.; Oliver-Solà, J.; Ugaya, C.; Rieradevall, J.; Gasol, C.M. Application of LCSA to used cooking oil waste management. <i>Int. J. Life Cycle Assess.</i> <b>2012</b> , <i>18</i> , 445–455.

# 3<sup>RD</sup> PART: APPLICATIONS

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## INTRODUCTION to the 3<sup>rd</sup> part

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### 1. Overview

The methodological propositions and the S-LCA framework that have just been described in the above 2<sup>nd</sup> part are applied on two case studies in this 3<sup>rd</sup> part of the thesis. The first case study corresponds to the assessment of two products traded under the three Alternative food networks (AFNs) that participated in the co-building of the S-LCA framework (cf. chapter 5). It includes most of the C&I of the framework and covers a broad product system, from primary production to the final consumption of products. This case study is presented in the following 6<sup>th</sup> chapter.

The S-LCA framework is also applied on another case study in the subsequent 7<sup>th</sup> chapter that complements the first application. In this case study, we assess the social sustainability of milk traded by a Belgian producer co-op named Biomilk.be.

We conclude this part with an analysis of the strengths and weaknesses of our S-LCA framework by putting in perspective one part of the application of chapter 6 and related results with the application of two other existing S-LCA frameworks, namely the Guidelines for S-LCA (Benoît and Mazijn 2009) and the Multiple Capital Model (MCM) Capacities S-LCA (Garraabé and Feschet 2013) (cf. Chapter 1 for more details on the frameworks), on a specific case study.

What gathers these case studies is the alternativeness of the assessed chains when comparing to mainstream food products and chains: they all can be described as Alternative food networks (AFNs).

## 2. Belgian AFNs as a field of application

### 2.1 What are AFNs? Their characteristics

As mentioned in the 5<sup>th</sup> chapter, AFNs include various practices that developed greatly in the last 30 years, at the level of production (e.g. organic agriculture, geographical indications/protected designation of origin, urban farming) and/or at the level of distribution (e.g. short supply chains such as farm shops, farmers' markets, Community Supported Agriculture and alternative chains such as fair trade, consumer food co-operatives, specialist food retailers). While some of those systems were dominant in the past (e.g. short food chains, consumer food co-ops), they re-emerged in the last decades "as a reaction against the standardization, globalization, and unethical nature of the industrial food system" in the view of mitigating its various negative social (that have been partly described in the 3<sup>rd</sup> chapter, on farm workers side) and environmental impacts (Edwards 2016, 2; Chiffolleau 2019). AFNs differ from mainstream food systems on several aspects; (Forssell and Lankoski 2014) distinguish three core characteristics of AFNs:

- **"Increased requirements for products and production.** Products circulating in AFNs are often characterized as "natural," which we understand as unprocessed and/or without additives. Production in AFNs is characterized as environmentally benign, as using artisanal or traditional production methods, or as territorially embedded (foods being linked to a specific area and its traditions of production, Morgan et al. 2006) and by small scale and diversity. The notion of "quality" used in characterizing products and production in AFNs is also linked to these attributes.
- **Reduced distance between producers and consumers,** which relates to the network and distribution arrangements in AFNs. The characteristic of reduced distance links to notions of localness, small size of networks, transparency, information, and "shortening" the supply chain. Here, we conceptualize reduced distance as encompassing three dimensions to capture its multiple meanings: physical distance, value chain distance (reflecting the number of intermediaries in the food supply chain), and informational distance (reflecting the ways in which AFNs increase the availability of information about foods, their production methods, producer and place of production, whether that be from face-to-face communication or through mechanisms such as labels or "value-laden" information on the packaging on products; see Marsden et al. 2000).
- **New forms of market governance,** or "new ways to coordinate production, purchasing, and commercialization" (Taylor et al. 2005, p. 200). We understand these as being linked to AFNs such as Community Supported Agriculture, consumer or producer cooperatives and Fair Trade, and as such, containing the ideas of redistributing power in the food network and sharing economic risk and/or resources." (Forssell and Lankoski 2014, 67)

### 2.2 The major expected social and socioeconomic impacts or claims of AFNs

Through those characteristics and ways of functioning, AFNs are expected to bring sustainability benefits, equally at the environmental, economic and social levels. For example, it is expected that the reduced physical distance would impact the environment positively through a reduced energy use for transport, support the local economy rather than remote economies and would help improve consumer health (through product freshness) and food security at local levels (through an increase in local food

production). It is because of the potential benefits of AFNs, especially social and socioeconomic ones, that we chose to focus on those systems.

However, some of the supposed benefits are sometimes questioned, by academics, experts or actors on the ground. This is the case of environmental benefits, which are questioned because of the small scales of the production and distribution systems that make AFNs often less productive and less optimized. But it is also the case of social and socioeconomic benefits, as exposed in the section below listing the expected social and socioeconomic impacts of AFNs, but also their unfulfilled promises. These are retrieved themselves mainly from the states of the art of (Forssell and Lankoski 2014) on AFNs, of (Kneafsey et al. 2013) on short food supply chains and local food systems and of the long-term research of (Chiffolleau 2019) on short food chains in France.

### **Support to local economy**

The preference for local products in AFNs would imply a contribution to local economy, rather than to remote economies (Forssell and Lankoski 2014). Some studies have calculated the ‘multiplier effect’, that assumes that “shortening the number of links in the supply chain results in increased local sales, increased demand for local services, and increased labour markets” (Kneafsey et al. 2013, 29–30). However, (Forssell and Lankoski 2014) report on a questioning over the impact of such development strategies for the development of other economies.

### **Healthier food and decreased health risks for farm workers?**

Given the higher requirements of AFNs in terms of products, the access to quality food is supposed to be improved, and consequently consumer health. Quality food entails natural, environmentally benign, artisanal, but also fresh food given the reduced distance feature. For this last dimension, questions are raised: delivery time and infrastructure should be considered instead of distance, since reduced distance does not mean reduced time and right conservation infrastructure (Forssell and Lankoski 2014).

On the worker side, health and safety risks would be diminished, thanks to the non-use of chemical products in organic farming. On the other hand, the diminished use of machines and fossil fuel in ecological and small-scale farming would increase the demand for manual work and farmer working time, that in turn increase work hardness and health risks (Kneafsey et al. 2013; Dumont 2017).

### **Preservation of food culture, traditional methods and food security**

Through this support to quality food in specific places, AFNs make it possible to preserve the food culture and the traditional and ecological production methods of specific regions. AFNs are also supposed to improve food security, by supporting organic farming, diversity of production and local production (Forssell and Lankoski 2014)

### **Employment, work satisfaction and social exclusion for farmers**

In supporting more labor-intensive production ways, including artisanal and ecological ways, AFNs would favor employment, since products require more labor per unit of input produced. On the other side, (Forssell and Lankoski 2014) point to a “lack of clarity over whether labor rights are considered in [those systems]”. According to (Chiffolleau 2019), short food chains would favor satisfaction at work, given the sense given to work, the integration of farms in the local community and the strengthened collaboration between farmers.

### **Participation, interactions, sense of community and behavioral change**

Indeed, the reduced distance between producers and consumers would increase trust and the sense of community as well as decrease the sense of exclusion among farmers and consumers, through their interactions and their participation in the decision making and functioning of food systems (Kneafsey et al. 2013; Chiffolleau 2019). The reduced informational distance would also involve a behavioral change, on both sides, thanks to the interactions and the exchange of information and knowledge: farmers would make their practices more ecological and consumers would make their consumption practices more sustainable (Forssell and Lankoski 2014). However, some question the quality of the exchange of information, face to face meeting not equaling high quality exchange of information and the effective participation of members in some systems (e.g. producer participation in fair trade schemes, consumers in CSA) (Forssell and Lankoski 2014; Kneafsey et al. 2013).

### **Affordable quality food**

The affordability of products in AFNs is often put forward as a main social benefit for consumers. However, AFNs are accused to reach only certain types of households, especially higher-income and high-educated households (Forssell and Lankoski 2014). In addition, just as for environmental impacts, reduced distance between producers and consumers and less intermediaries does not mean necessarily lower costs. First of all, the small scales of production and distribution systems discriminate AFNs against classical products. Second of all, the absence of a wholesaler or of a retailer in a product chain does not mean that the tasks of logistics and selling are not done, but that it is done by another actor (producer co-op, farmer).

### **Fair price and farm profitability**

On the other side, because of the differentiated production methods, the reduced informational distance and of the direct relationship with consumers/the more balanced relationship with intermediaries (e.g. in Fair trade), it is argued that farmers should be able to receive a higher or fairer price for their products. Higher prices should help farms to improve their livelihood, together with other parameters such as the sharing of resources (in the case of producer co-ops) and of risks (in the case of CSAs) (Forssell and Lankoski 2014). Some studies question however the actual sharing of risks by consumers in CSA. Also, some case studies found higher incomes in fair trade initiatives, but producer prices would be yet not high enough, and the rare case studies looking at economic returns of short food supply chains within large surveys show rather disappointing results: in the US with “the use of farmers markets [being] negatively associated with income” (Jematsu and Mishra 2011, cited by (Kneafsey et al. 2013, 32)); an extensive review of studies analyzing CSAs in the US and Canada concludes that “CSAs may not provide a living wage for farmers”, though CSA farmers seem to come out ahead when comparing them with farmers using conventional chains (Brown and Miller 2008) cited by (Forssell and Lankoski 2014, 70); (Galt 2013) talks about “self-exploitation” of CSA farmers in the US, because of their “strong sense of obligation to their members” (Galt 2013, 341); in France, incomes of vegetable farms involved in short supply chains are found lower when compared to farms trading their products both in short and long chains (Chiffolleau 2019). The same study finds however that those farms generate a good cash flow thanks to the regular and quicker payments provided in short chains, have a low debt level and rely less on subsidies.

Also, even if value may be higher with direct selling, it “may require significant resources, time and energy from the producers”, this questioning the profitability of direct selling (Forssell and Lankoski 2014, 71).



However, “without short chains, a number of farms would have disappeared and would not have been established” as pointed out by (Chiffolleau 2019, 59), short food chains being a way for small-scale and ecological farms to be maintained.

### **3. Objectives of the applications**

On an empirical level, through the following S-LCA applications, we aim to examine whether AFNs claims that we sketched out are met. More specifically, we want to verify the assumption that chain governance and transaction modalities matter for the social sustainability of products, including for workers. Given the basic characteristics of AFNs (as described above following (Forsell and Lankoski 2014), especially in terms of governance, we assume initially that social sustainability of products traded by AFNs is higher, but as sketched out above, the reply might be more mitigated than initially expected. Finally, we also aim to identify potential stressors of negative social impacts and improvement levers.

On a methodological level, we want firstly to test the applicability of our proposals and S-LCA framework. The first application (chapter 6) can be considered as the ‘time 0’ application which contributed to shaping the methodology, until its application on a case. The second application (chapter 7) can then be considered as a validation of the good working of the methodology, also outside the ‘habitat’ in which it was developed.

Also, we thought initially that working on AFNs should simplify the applications: the local nature of AFNs would facilitate access to data/information and make the chain actors accessible (on the upstream side of chains, because farms are local, and on the downstream side of chains because sellers have a direct contact with their final consumers). Also, the limited number of actors, or the length of the chain would also facilitate the methodological work and application.



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## CHAPTER 6: How do chain governance and fair trade matter? A comparison of social sustainability performances of food products traded under 3 Belgian AFNs

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Sureau, Solène, François Lohest, Joris Van Mol, Tom Bauler, and Wouter M. J. Achten. 2019a. "How Do Chain Governance and Fair Trade Matter? A S-LCA Methodological Proposal Applied to Food Products from Belgian Alternative Chains (Part 2)." *Resources* 8 (3): 145. <https://doi.org/10.3390/resources8030145>.

### 1. Introduction

#### *1.1 Alternative food networks as responses to food chain issues or how chain governance could matter*

The food sector echoes with many social and socioeconomic issues, relating to consumers (through the satisfaction of a need or access to healthy food), society as a whole (given its role in providing jobs and livelihood) and farmers and agricultural workers, given the particular issues occurring in the sector, as we have seen in the 3<sup>rd</sup> chapter. AFNs have been developed to reduce environmental impacts, but also to offer healthier food for consumers and to provide an outlet and decent incomes for small-scale, and/or ecological farms. The latter do not always find income generating outlets in mainstream chains, which are dominated by large wholesalers and retailers who would impose trading conditions which are not in farmer's favor (De Schutter 2010). It is thus believed that cutting down intermediaries or going through alternative actors will benefit farmers, and overall the social sustainability of products (Forssell and Lankoski 2014). These social promises of AFNs are partially in line with the promises of the fair trade movement whose objective is more balanced and equitable trading relationships to support producers in the south who do not benefit fully from classical trade (WFTO 2015). It is also congruent with academic analyses on global commodity chains (GCC), which look at the power relations between value chain actors and at how these impact on the distribution of added value.

According to empirical works from civil society NGOs (Wilshaw 2010; Clean clothes campaign 2009) and from GCC and related branch's research works (Locke 2013; Rossi 2011; Barrientos and Smith 2007), the way that mainstream product chains are currently governed between value chain actors, including sourcing, purchasing and pricing practices of global buyers impacts negatively on the working conditions at supplier's plants. This is also recognized by the Internal Labor Office (ILO) which states that, "The intense competitiveness and short product cycles in some global supply chains [...] feed down to workers' contractual arrangements and working hours" (ILO 2015, 15). The present chapter intends to develop a discussion of the role of food chain governance arrangements in co-determining aspects of social sustainability. In particular, the chapter develops on an empirical exercise which assessed social sustainability at the level of AFNs, i.e., at the level of those food chains which carry a heavy load of promises to outperform the classical, commoditized global, food chains.

## ***1.2 Chain governance and product social sustainability: a rather unexplored link in S-LCA***

As we have seen in the previous chapters (1, 3, 5), as a tool designed to assess social impacts of a product's life cycle, the practice of S-LCA paid however surprisingly little attention to issues of chain governance until now, in particular when chain governance could be seen as co-determinant of social sustainability performance. This might come from the fact that S-LCA is mostly used as a mere reporting tool (Feschet 2014; Macombe 2013a) (and the life cycle impact assessment, or LCIA, is a referencing exercise, as done by so-called type I studies), and because the few S-LCA studies investigating impact pathways (the so-called type II LCIA studies) look at the downstream part of impact pathways (assessing endpoint impacts, i.e., health and well-being impacts of practices of companies), rather than looking at the upstream part of impact pathways (investigating the potential explanatory variables or root causes of "bad" practices or performances of companies) (Sureau, Neugebauer, and Achten 2019, chapter 2).

Noticeable exceptions are two studies in the LCA and S-LCA fields seeking to link chain governance aspects with working conditions along the supply chain. On the basis of the theoretical background of Value chain analysis and with a case study of vegetables traded by a big UK retailer, Sim tried to establish a relationship between the product chain governance structure, the distribution of added value and the wage levels of workers in the food industry (Sim 2006). Bouzid and Padilla put in perspective their S-LCA results on working conditions in a tomato paste chain with the distribution of added value per labor unit. They concluded that the life cycle phase with the worst working conditions (i.e., tomato growing) is the one with the least added value per labor unit and argued for a fairer distribution of added value as a way to boost social upgrading (Bouzid and Padilla 2014). Our paper seeks to continue this exploration of chain governance in relation to social sustainability, with the objective to feed in the discussion about what S-LCA should assess.

## ***1.3 Objective of the article and structure***

The investigation of the link between chain governance, employment and working conditions in supply chains is limited within S-LCA, where the focus is often solely on workers (Sureau et al. 2017; chapter 1); but also within GCC analysis and related branches, which focuses on firms of production networks, but less on workers (Barrientos, Gereffi, and Rossi 2011). With this case study, we propose to bridge both approaches, building on the few GCC studies (Locke 2013; Barrientos, Gereffi, and Rossi 2011; Barrientos and Smith 2007) and LCA studies (Sim 2006) that investigate the link between chain governance and working conditions. We investigate this link through a novel approach for the type II LCIA based on the qualitative analysis of a S-LCA comparative case study, in which we compare sustainability performances of food products traded under three different Belgian AFNs that differ in terms of chain governance (number, type and characteristics of intermediaries): An organic shop, a web-shop for local products and a network of community-supported agriculture (CSA), in which a group of consumers subscribe to a harvest of a certain farm and receive in return a weekly box of farm goods ("Community-Supported Agriculture" 2019).

For this investigation, we use a S-LCA framework or list of assessment criteria and indicators that has been designed especially for that purpose, that places chain governance as drivers or as explanatory factors of other social sustainability aspects (cf. chapter 5). One of our objectives was thus also to test with this case study the applicability of the new S-LCA framework, which spotlights chain governance aspects, and our methodological proposal for LCIA.

We decided to assess products traded under AFNs also because their social sustainability benefits are questioned by academics, while AFNs seek initially to address social (and environmental) issues in the food chain (cf. introduction of this 3<sup>rd</sup> part). With S-LCA, that type of alternative chain has not been examined, with the notable exception of a study on an oyster value chain in Denmark, in which the growing and harvesting of native oysters is done by consumers themselves (Wangel 2014).

Consequently, our research questions were the following: Do AFNs bring actually the expected benefits and improve working conditions and incomes of value chain actors, especially farmers? And from those results, what can we conclude on the relevance of including chain governance aspects as explanatory factors of other social sustainability issues in S-LCA? With this case study, we will thus (i) bring answers as to the social sustainability of AFNs, but also (ii) over the use of chain governance indicators in S-LCA. With this case study, we will also learn about (iii) the relevance of the investigation method we used, that is quite different from usual methods used by S-LCA researchers to investigate impact pathways (cf. part on type II LCIA below) (Sureau, Neugebauer, and Achten 2019; chapter 2).

In the next section, we detail the methodology used to conduct the case study, followed by the presentation of the results. In a last section, these results are discussed as well as the relevance of our framework and methodological proposal in general.

## 2. Materials and method

In the present section, we explain the methodology used, according to the steps required for life cycle assessments (presentation of the goal and scope, inventory, life cycle impact assessment and interpretation). Main steps are summed up in Figure 20.

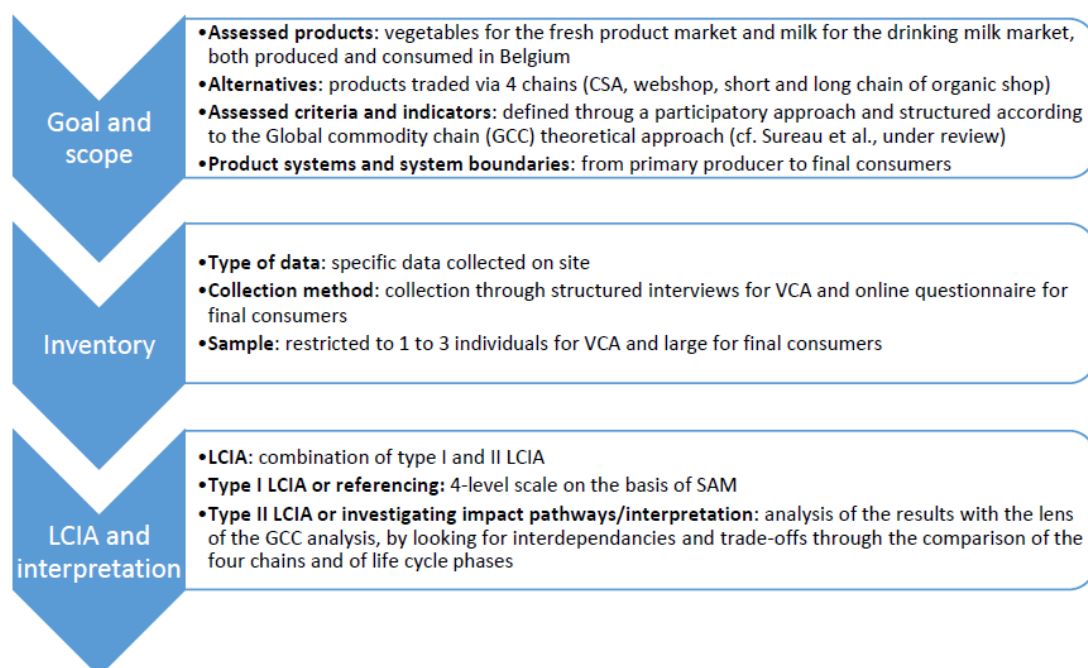


Figure 20. Methodological steps and choices.

## **2.1. Goal and scope**

### **Assessed products and alternatives**

With this case study, we compare the social performances and potential impacts linked to the production, distribution and consumption of two kind of products that are traded through four different alternative chains: Vegetables for the fresh product market and milk for the drinking milk market, both produced and consumed in Belgium.

### **Assessed criteria and indicators**

In terms of assessed criteria and indicators, we use a specific framework presented in the first part of this article (Sureau et al. 2019; chapter 5), as mentioned earlier. However, as this case study aims to test the applicability of the framework, some simplifications have been done, predominantly on the criteria and indicators, which are not all assessed with this case study: For some of them, it was not possible to collect data, such as detailed accounting data or data to quantify the production (e.g., price fairness assessed by the coverage of cost price by the selling price, the true price (whether all costs are included in the price or jobs related indicators); for others, we lacked the financial means (e.g., nutritional quality); some indicators were not robust enough or not found (conservation of heritage and know-how or participation of workers to decision making), or we felt lacking the knowledge to apply them (e.g., animal welfare, safety of work conditions). The list of assessed criteria, indicators and reference points is detailed in Table 16 of Supplementary material 7. It regards chain and VCA governance, VCA, workers and final consumers.

### **Product systems and system boundaries**

As we assess different product chains which involve different actors for the various life cycle phases, we present first, the product systems of mainstream chains for vegetables and drinking milk produced and consumed in Belgium (that are partly assessed in this case study, as a benchmark, see Figure 21 and Figure 22).

#### **Mainstream chains as a benchmark**

Mainstream chains for local organic food products (including fresh vegetables and drinking milk) function similarly to chains for local conventional products (Sureau 2014). They start from supermarkets, which are the first channel both for conventional and organic segments, though less dominant for the latter (Verbeke 2015). Through their central purchasing office, supermarkets mainly source local vegetables directly to auction house cooperatives, that are supplied by farmers. For drinking milk, central purchasing offices deal directly with dairies to arrange the production of milk bottles or cartons marketed under private labels of retailers. Dairies have often complex ownership structures, including a parent company and subsidiaries, and the biggest ones in Belgium collect the milk directly from farmers.

On the same figures are presented the boundaries of both systems, which go from the primary producer to the final consumer. Our systems include the main first-order VCA (excluding for the stages of production of inputs used by farms and of end of life of products), but do not include the various actors which provide goods and services to the first-order VCA (e.g., energy providers, banking services).

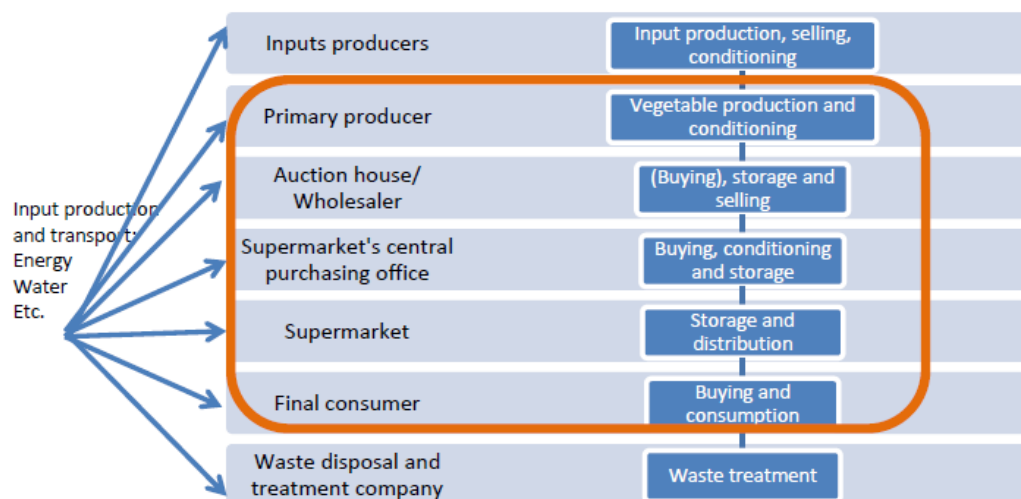


Figure 21. Mainstream product system for fresh vegetables. The orange line indicates the system boundaries of the study.

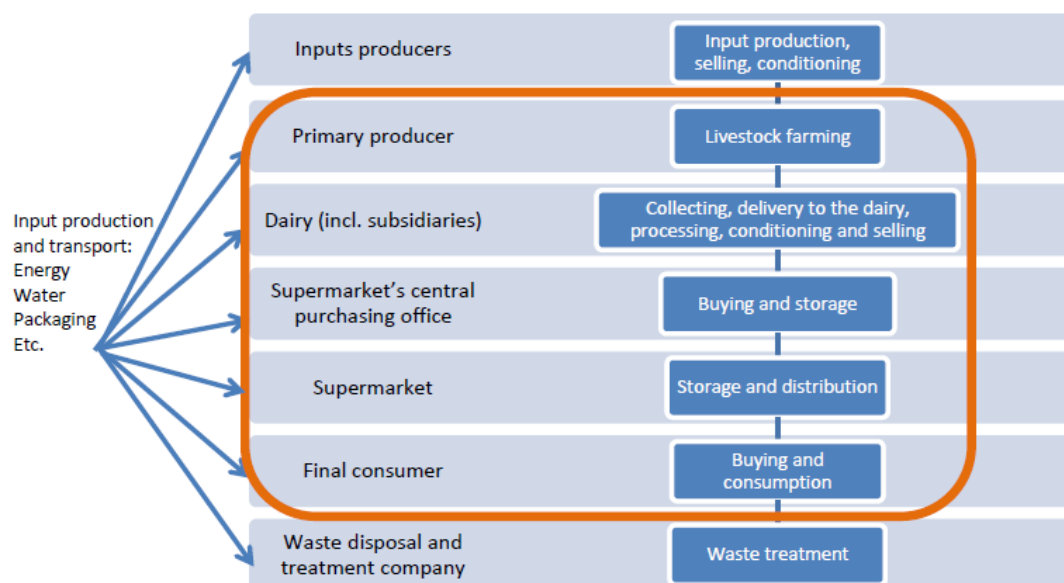


Figure 22. Mainstream product system for drinking milk. The orange line indicates the system boundaries of the study.

### Product systems of assessed alternatives

In Figure 23 and Figure 24 (and subfigures a–d), we present the product systems of our alternatives. In the **CSA system** (figures a), every week (or two) a farm delivers its products directly to a group of consumers. The group takes care of the distribution, sometimes with the support of the farmer. An association networks all CSA groups of the region and supports the system, with the selection of organic and small-scale farms.

The **webshop system** (figures b) is less stringent on farming practices and sources its products from local organic or conventional farmers, small scale for dairy products and medium scale for vegetable growers. The webshop is centrally managed by the digital tool provider, which is a start-up located in France. At the local level, a person is in charge of organizing and hosting weekly distribution, gathering food producers or processors located within a distance of 250 km from the distribution place. Consumers order their products a few days before the distribution through the webshop and the distribution is

done by the producers/processors themselves, as in a market. The transaction is between the producer/processor and the consumer, and the host and the webshop start-up each charge 8.35% on each transaction (excl. value added tax) for their services. Thus, they do not act technically as intermediaries, because they never own the product. However, we consider the host as an intermediary, since without him/her, the transaction cannot take place.

The **organic shop** is a chain of three shops in 2016, but with the ambition to expand significantly in the coming years. The organic shop operates as a classical supermarket but sells organic products only and favors local products. For the organic shop, we assess two chains by product: For vegetables, a short chain (Figure 23c) where the primary producer sells directly to the shop, and a longer one (Figure 23d) where a wholesaler takes part; for drinking milk, a short chain (Figure 24c) where the drinking milk is processed on farm, and a longer one (Figure 24d) where it is processed in a dairy.

### **Goal of the assessment**

With those two case studies, our goal was to provide a detailed picture of product chains (which actors are involved in the value chain and how they relate to each other), which often lack transparency for consumers, and of performances and potential impacts related to the life cycle of products. Our objective was to better understand what the social hotspots in those chains are, and what the constraints to be removed are in order to improve performances.

## **2.2. Inventory**

Specific data or data collected on-site was used for all processes included in the system boundary. In fact, information on supply chains is in general poor, and S-LCA can be used as an empirical tool to gather information on product supply chains. Generic data was used to interpret results, and for specific processes for which there was no access to specific data.

To inform most indicators, 2-h structured interviews were held with the various value chain actors (retailers, wholesalers, processor/co-op, farms, i.e., around 20 VCA). Those interviews were conducted with the support of a questionnaire to inform specific indicators, but space was also left to open discussion. For some of them, interviews were complemented with the consultation of legal and accounting documents. Workers (including managers) of farms only were asked to fill in a questionnaire, because not all other VCAs agreed to forward our questionnaire. Some data is missing from specific actors (farms' daily workers) or for specific indicators (profitability of farms for some of them) due to confidentiality reasons. For the mainstream chain (used as benchmark), specific actors have not been met, and information was obtained from the above-mentioned interviews and from grey literature. Data regarding consumers was gathered through an online questionnaire. As regards the sample, from these online questionnaires, we obtained 386 replies from consumers of the three AFNs. For the CSA and webshop systems, we collected data from two to three farms per system. For the organic shop chains, we collected data from one farm for each product. Overall, that rather small sample does not provide representative results for the four assessed chains (except for the webshop chain, which works for the assessed products with a smaller amount of VCA than the CSA and organic shop chains). A bigger sample would have brought more robust results; the rather small sample is another simplification that had to be done given the experimental nature of the case study.



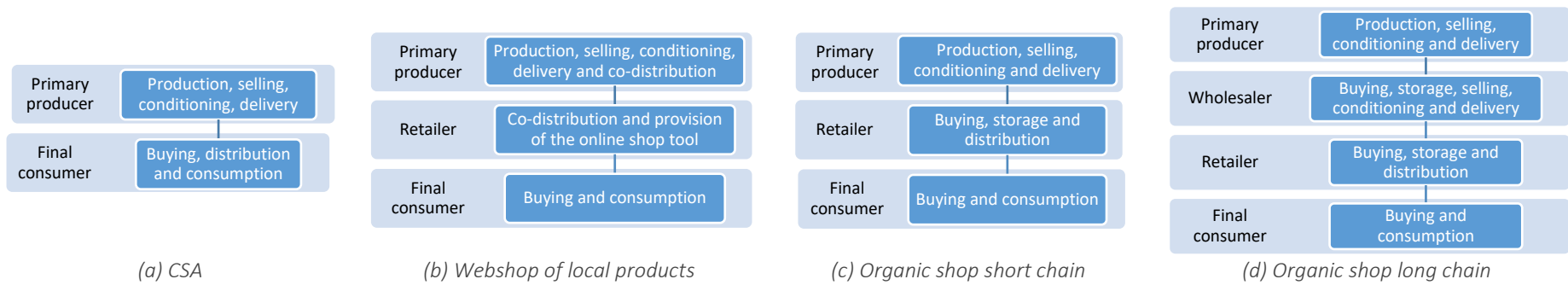


Figure 23. Product systems of the 4 alternatives for fresh vegetables.

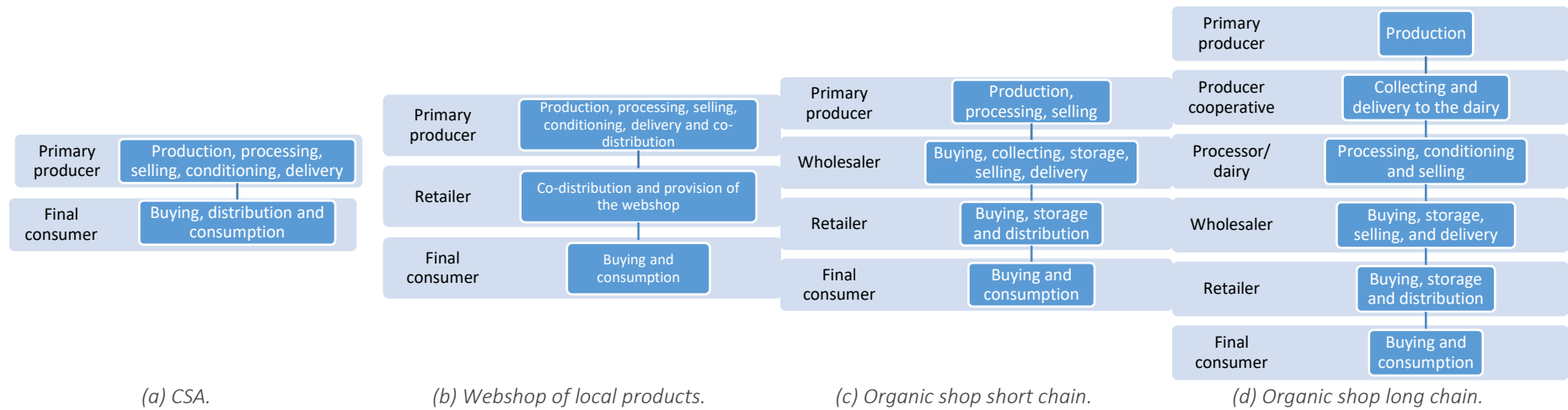


Figure 24. Product systems of the four alternatives for drinking milk

### **2.3. Life cycle impact assessment (LCIA) and interpretation of results**

For the third phase, the life cycle impact assessment (LCIA), we combined type I and type II LCIA, as detailed in our methodological proposal (Sureau and Achten 2018; chapter 4 and 5). In a first part, we present the assessment of performances of products chains on all selected sustainability aspects, by comparing results with performance reference points (what is done conventionally in S-LCA and called type I LCIA or referencing). In a second part and in a novel way, we analyze and seek to identify interdependencies and trade-offs between indicators or sustainability dimensions (what in S-LCA can be referred as type II LCIA, or the investigation of impact pathways) (cf. (Sureau and Achten 2018); chapter 4 and 5 for details and rationale).

#### **2.3.1. Type I LCIA or referencing**

Results on all indicators are referenced with a type I LCIA. Most indicators being qualitative, we designed for reference points, a 4-level scale on the model of subcategory assessment method (SAM) (Ramirez et al. 2014), with A to D scores, and the specification of a basic requirement to be fulfilled (corresponding to the B-level). For building the reference points, we consulted the project's partners; however, the final decision was made by the researchers, in order to ensure coherence with the SAM framework. Reference points were based on legal norms, industry means or practices depending on the indicator. For the presentation of results, a four-color scale has been used. The color represents the score obtained for each indicator (A, B, C or D). For VCA, when results of several individuals (e.g., farms) are presented, the color is the one of the worse result, since no average has been made or aggregation has been done for them, given the small size of the sample. For final consumers, the results and color correspond to the averages of all individuals who responded to the survey.

Through this assessment, we will look at whether the assessed AFNs chains keep their promises on the various sustainability dimensions described in the literature but also questioned by some authors (e.g. Forssell and Lankoski 2014; Tregear 2011), including: Democratization and fair trade (i.e. relations between VCAs or how the chain is governed and what the transaction modalities are), better social ties and profitability (i.e. sustainability performances of VCA), better employment and working conditions (workers), better product quality, accessibility and consumer education (consumers).

#### **2.3.2. Type II LCIA or interpreting results by investigating impact pathways**

Instead of merely considering indicators in isolation (as done in type I LCIA), we looked for relationships and trade-offs between indicators, especially between indicators considered as explanatory variables and indicators considered as explained variables. Our main assumption was that chain and VCA governance and transaction modalities (explanatory variables) influence the way certain activities impact on other stakeholders (VCA, workers, final consumers) (explained variables). This investigation was done through the comparison of S-LCA results between the four analyzed product chains on both case studies through the lens of GCC analysis. Additionally, other factors influenced performances of VCA. In this study, we aimed to check the relevance of selected variables and potentially to identify other explanatory variables.

### **3. Results of type I LCIA: reporting on hotspots**

For the first dimension, performances of mainstream chains are presented before the performance of the AFNs.




### 3.1. Chain and VCA governance or the promises of democratization and fair trade

#### 3.1.1. Mainstream chains

Mainstream chains of fresh vegetables and drinking milk included, respectively, 2 and 1 intermediaries (an intermediary being a VCA that does not process the product, conditioning not being counted as processing) (cf. Figure 21 and Figure 22 and last lines of Table 14 and Table 15). The three **main retailers** in Belgium are public limited companies (Plc) quoted on the stock exchange, which would mean a loss of control for their managers and workers according to our framework. Limiting the power of controlling partners or promoting shareholding by suppliers or clients are not on their agenda. Those three retailers have strong market power, since they had 65.4% of market shares in 2014 (46% for organic products in 2017 (Biowallonie 2018)). For local fresh vegetables and drinking milk, their central purchasing offices buy directly from **producer co-ops or processors**, which are big actors as well: The three biggest producer co-op auctions buy 87% of Belgian vegetables and the four biggest dairies share more than 80% of the dairy collection. Following the retailing industry, producer-co-ops encountered a large move of merges and acquisitions, reducing the number of fruit and vegetables auctions in Belgium from 10 to 6 in 10 years (Verbeke 2012; Rizet et al. 2008) and the number of dairy collectors from 95 in 1976 to 15 in 2014. At the same time, in the dairy industry, dairy co-ops became complex structures, with a subsidiarization phenomenon (Filippi 2016). While producer co-ops have been founded by farmers to support them in the marketing of their produce, these co-ops became so big that farmers do not always feel as if they control it and trust it (EMB 2012; VRT 2018).

Table 14. Chain and value chain actors (VCA) governance of fresh vegetables chains.






SP = Sole proprietorship company, Ltd. = Private limited company, Plc = Public limited company, Nap = not applicable, Nav = not available

Criteria	Farm 	Co-op/wholesaler 	Retailer 	Chain
Chain length	A			(a) CSA
Level of control of the organization	SP/co-op farms			
Participation by other VCA	Nap			
Competition management	Nap			
Market power	A			
Chain length	B			(b) Web-shop
Level of control of the organization	Mainly SP farms		Retail co-op	
Participation by other VCA	Nap		B	
Competition management	Nap		B	
Market power	A		B	
Chain length	B			(c) Organic shop short chain
Level of control of the organization	Co-op farm		Retail co-op	
Participation by other VCA	Nap		B	
Competition management	Nap		C	
Market power	A		B	
Chain length	C			(d) Organic shop long chain
Level of control of the organization	SP farm	Ltd wholesaler	Retail co-op	
Participation by other VCA	Nap	C	B	
Competition management	Nap	C	C	
Market power	A	C	B	
Chain length	C			Mainstream chain
Level of control of the organization	SP farm	Auction co-op	Plc retailer	
Participation by other VCA	Nap	A	C	
Competition management	Nap	C	C	
Market power	A	D	D	

This is reflected in **transaction modalities** (as shown in Table 17 and Table 18 of Supplementary material 9): While producer co-ops or dairies are secured outlets for farmers, farmers have no say on the price. In the case of **vegetables**, the auction charges a fee for selling the production of its members (Sureau 2014). In the case of conventional vegetables, farmers do not even know in advance the selling price (Verbeke 2015). In the transaction between auctions and big retailers, there is not much room for negotiations, and prices are market-based. Retailers do not use contracts and for organic vegetables, over-the-counter trading takes place (contrary to conventional vegetables which are sold through auctioning). **Organic drinking** milk sold through supermarkets are sold mainly under retailer private labels<sup>34</sup>. Dairies have generally 6 month long contracts with retailers to process milk cartons, at a fixed price and indicative quantity. Upstream the chain, in Belgium, most of the milk would be collected by one private dairy (Verbeke 2014). Farmers generally have contracts, but the dairy imposes a “unilateral control on volumes and prices” (Lambaré, Dervillé, and You 2018, 65–66), which are based on competitor prices.

In short, while mainstreams chains are characterized by a strong dominance of buyers (retailers, processors and auctions), transaction modalities are logically in favor of buyers: There is a commitment from dairies and co-op auctions, but a market-based price is imposed.

Table 15. Chain and VCA governance of drinking milk chains

Criteria	Farm 	Co-op 	Processor 	Wholesaler 	Retailer 	Chain
Chain length	A					(a) CSA
Control level of the organization	SP/co-op farms					
Participation by other VCA	Nap					
Competition management	Nap					
Market power	A					
Chain length	B					(b) Web-shop
Control level of the organization	Mainly SP farms				Retail co-op	
Participation by other VCA	Nap				B	
Competition management	Nap				B	
Market power	A				B	
Chain length	C					(c) Organic shop short chain
Control level of the organization	SP farm			Ltd wholesaler	Retail co-op	
Participation by other VCA	Nap			C	B	
Competition management	Nap			C	C	
Market power	A			C	B	
Chain length	C					(d) Organic shop long chain
Control level of the organization	SP farm	Prod co-op	Plc dairy	Ltd wholesaler	Retail co-op	
Participation by other VCA	Nap	A	A	C	B	
Competition management	Nap	A	A	C	C	
Market power	A	D	C	C	B	
Chain length	B					Mainstream chain
Control level of the organization	SP farm	Plc dairy			Plc retailer	
Participation by other VCA	Nap	C			C	
Competition management	Nap	C			C	
Market power	A	D			D	

<sup>34</sup> According to our interviews and to statistics showing the supremacy of private labels in terms of market share for drinking milk (Syndilait et CNIEL 2017), especially for the organic segment (BADER 2018).

### 3.1.2. CSA chains

Opposed to these mainstream chains, CSA chains for vegetables and drinking milk include only two actors: Farms and final consumers. In these chains, there is no visible takeover and control by other, more powerful, VCAs. The production segment is atomized, and consumers are gathered in buying groups of 20–30 households. VCAs participate in the decision making of the distribution system through their membership to the networking association.

**Between the farmer and the consumer group**, there is an informal commitment of the farm to deliver its products every week or every two-weeks during a year or more and consumers to buy it. Consumers pay for delivery periods of three months beforehand, hence securing the outlet of the farmer. **For vegetables**, the box price is set for the season, but the content (what kind of vegetables) and quantity delivered vary. Thus, consumers share farmers' risks: They get less in their box if the crop is not good (effectively, if the crop is not good, the farmer will generally buy vegetables elsewhere and put it in the box; for the farmer, it is a way to get an income (with the margin taken) even if the crop is not good). **For milk**, the contract is different: Consumers order dairy products for 3 months, that they will get every two weeks. If the farmer is not able to provide the product (e.g., because of a decrease in milk production), consumers will get reimbursed. Thus, the outlet is secured for dairy farmers, but there is less risk sharing, undoubtedly because dairy production is supposed to be more predictable (effectively, milk production relies on feed production, which also relies on weather conditions, so the functioning should logically be the same as for vegetables).

### 3.1.3. Webshop chains

In the webshop chain, we consider **the host** to be an intermediary. Technically, he/she is only a service provider, but the host selects the supplier participating in the sale. Also, the transaction cannot happen without the online-tool, and the whole system benefits from the brand provided by the tool. The host and suppliers are actually dependent on the tool but they have no say on it, since it is managed by a public limited company (Plc) based in France (the start-up is not included in our product system since it is a service provider. However, given the importance of this service provider for the chain, we included it in the analysis). The numerous hosts using the tool are thus not involved in the making of major decisions. This lack of implication can be problematic, as happened lately when the Plc decided unilaterally to increase its fees, what might put at risk the activity of the host and of his/her suppliers. For its part, the host's status is a retail co-op, but actual suppliers and final consumers participate to a small extent in formal decision-making given their limited participation to the capital. However, there is a mechanism in place to limit the power of controlling partners, according to basic principles of cooperatives. In these chains, the retailer co-op has a low market power, given its small size.

**Between final consumers, the host and suppliers**, there is no commitment or contract, and consumers order every week, the products they want. In addition, on the host side, which runs a physical shop separately, the objective is to facilitate the buying by final consumers from their selection of suppliers. There is a competition management, limiting competition between suppliers within the distribution system.

### 3.1.4. Organic shop chains

#### Downstream side of chains

The organic shop sources most of its products from wholesalers. Then, wholesalers source local products from processors or farms. For a few products, it sources from farms and processors directly,

as in the case of the short vegetable chain (cf. Figure 23 and Figure 24, representing the product systems of the four chains described below).

The **organic shop** is also a retail-co-op. It is currently a small actor in a quite concentrated market driven by big retailers, which take more and more shares of the organic market with the rise of discount retailers. The shop chain is currently owned by known investors, mainly. However, as a co-op, shareholding by other VCAs is open and promoted. This is different from wholesalers supplying the shop, which are Plcs, whose status does not facilitate the participation of other VCAs. Even if one of them is actually owned by some of its suppliers and clients, this type of ownership is different from producer co-op ownership, since it is not open and does not meet the democratization promise.

#### Upstream side of chains

The retailer and wholesalers are not committed to particular suppliers, and they can switch to other cheaper suppliers, meaning that there is no mechanism to manage competition upstream. This is also true for the organic shop short chains, where there is no formal contract towards farmers either.

In the **vegetable long chain**, an informal contract between the wholesaler and the farm is made at the planting period, on the model of contract farming<sup>35</sup>. According to this contract, the wholesaler commits to buy to the farmer an indicative quantity of products (i.e., in quantity of planted area) and the farmer plants or seeds accordingly.

In the **drinking milk long chain**, farmers sell their milk to a producer co-op, which itself, together with two other producer co-ops of the region, own subsidiaries to process and distribute products. Both farmers and the co-op have secured outlets, since the dairy co-op and its subsidiaries are meant to buy and sell all the supply of, respectively, its members and shareholders as the priority. In this sense, there is a high level of formal control of the downstream chain by farms. However, as in mainstream chains, which includes the same kind of actors, the power of farmers might be diluted given the size of the co-op, which is the second biggest dairy collector of the country. Given this size, market power is unbalanced between farms and the dairy co-op and its subsidiaries, which raises the question of whether the transaction can effectively be in favor of farmers.

#### 3.1.5. Price setting mechanisms

The way that **producer prices** are set varies according to chains and VCAs. In **short chains** (CSAs, webshop and organic shop), the seller, i.e., the farmer, sets the price, even if a wholesaler is involved, as in the drinking milk short chain of the organic shop. However, for the CSA and organic shop short chain, farmers set their price on the basis of market prices, while farmers selling through the webshop set their prices on the basis of cost prices. In **longer chains**, wholesalers and the retailer negotiate prices or sales conditions. Upstream in the chain, the dairy producer co-op even imposes a market-based price to its dairy farmers (it has to be noted that the co-op distributes potential dividends to its members yearly, within a defined limit). This means that even a producer co-op does not offer necessarily fair prices to its members/suppliers, in spite of the fact that suppliers control the co-op. Market prices are disconnected from cost prices, and differences between them can be large, especially for small-scale farms. Currently, on the Belgian organic market, there is not much pressure on prices, with demand exceeding supply. However, with the production growth going on, it is likely that in the coming years organic prices will be subject to the kind of price pressure that conventional prices undergo.

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<sup>35</sup> Contract farming is “an agreement between a farmer and a buyer, often an agribusiness, to grow produce with set terms and conditions for things like price, quantity, quality and inputs” (IISD n.d.).

On the other side, **processors, wholesalers and retailers** set their prices on the basis of cost prices (e.g., by applying different margins according to loss rates).

The Fair Trade movement states that **a transaction is fair** if two main conditions are fulfilled: There must be a contract or long term commitment between VCAs, and the price must cover cost price and a decent income. We thus conclude that transactions are not fair in any of the assessed chains. On one side, in most of them, there is no commitment, except for the CSA and the dairy co-op. On the other side, the price is either imposed by the buyer, or negotiated, and it is not based on cost price, except for the webshop chain, which, as said, does not provide secure outlets.

**In a nutshell**, while AFN chains include in some nodes other VCAs in decision making, longer chains of the organic shop are still unbalanced given the presence of wholesalers and dairy co-ops with high market power. In that sense, the long chains of the organic shop for vegetables and drinking milk appear to be alike mainstream chains (except for the retailing node), in terms of chain governance. In terms of transaction modalities, they do not seem to be fairer than conventional chains either. Shortest chains (CSA, webshop and short vegetables chain of the organic shop) seem more balanced; however, trading relationships are not fair: VCAs guarantee either commitment (CSA), fair price (webshop) or none of these principles (retailers and wholesalers of the organic shop short chains). However, their practices are still more compliant to fair trade principles than the ones of conventional chains, where VCA, including big retailers, do not commit on quantities, and negotiate prices with most suppliers.

### ***3.2. Value chain actors and the promise of better social relationships and profitability***

As depicted in Table 19 and Table 20, while commitments are rare in the assessed chains, the **level of trust** over the continuity of the trading relationship is very high in almost each transaction, and surprisingly, where the commitment is high (CSA chains), the level of trust is lower. We observe that farmers feel very well recognized by their clients, and well understood, while intermediaries (retailers, vegetable wholesaler, dairy processor) do not score so well. Results for farms contrast with general beliefs on farmers who would lack recognition for their work and who would suffer from a negative image.

Regarding **profitability**, as a main observation, while intermediaries are profitable, most farms of assessed chains are not, and the organic shop is not either. Regarding the latter, the development of the chain of stores driven by the head office puts a strain on profitability.

At the other end of the chain, the profitability objective is not met for most vegetables farms. Only three vegetable farms were profitable (selling through the webshop, the CSA and the organic shop long chain). However, two out of the three earned a large part of their income from non-production related activities (e.g., markets including a purchase and resale activity, i.e., the sale of products from other farmers). The large-scale farmer supplying the organic shop long chain even stated that he, “Should do only that rather than producing vegetables [him]self” when looking at the differences in earnings of both activities (for this farm, non-production related activities were run through a separate company, which explains the negative result mentioned for this farm).

Within dairy farms that accepted to share their data on profitability, results are mixed. Two CSA farms out of three and one farm supplying the webshop were not profitable, contrary to both farms supplying the short and long chains of the organic shop.

Assessed farms did not perform well on profitability, but how did farms of the region perform overall? It seems that the situation of the assessed farms is quite common: Over the 2014–2016 period, 56% of

Walloon farms earned less than €15,000 per labor unit per year, with dairy and mixed farms being one of the least profitable farms (excluding farms with a turnover of less than €25,000) (SPW Agriculture 2018). In Flanders, 33.7% of farms earned less than €15,000 per labor unit per year, over the 2014–2016 period (Vlaamse Departement Landbouw en Visserij) (the difference between Wallonia and Flanders can be explained by the type of farming and the type of crop that is mainly farmed).

### ***3.3. Workers and the promise of better employment and working conditions***

Results on profitability mirror results on **employment conditions**: Problems were found only in the organic shop and in farms (cf. Table 21 and Table 22). The organic shop used a high number of permanent employee contracts, but it also used atypical contracts that were unstable and that did not provide full benefits to workers: Temporary employee contracts accounted for 23% of worked hours, including subsidized ‘student contracts’ for 11%, as it seemed to be the industry standard (Observatoire bruxellois de l’emploi 2014).

In most vegetable farms, employment conditions are mostly not compliant with our criteria. The only farm that provided jobs with full benefits only (employee contracts, fixed-termed and open-ended) was the one supplying the long chain of the organic shop, but it provided as well, some fixed-term contracts. The two other farms providing jobs with full benefits used at the same time subsidized and daily contracts (the one selling to the organic shop short chain and the one selling to the webshop). Remaining farms supplying CSAs and the webshop used non-paid familial labor or subsidized and unstable work contracts, but did not create any other good quality jobs. Dairy farms seem to resort rather to non-legally compliant labor arrangements and the main issue is the use of unpaid familial labor by farms processing milk themselves mainly.

In terms of **work hardness** (cf. Table 23 and Table 24), weekly working time exceeded the maximum allowed in agriculture in all farms, except one. In seven farms out of 15, the farmer worked even more than 68 hours a week. This is well above the European average of 46 h per week (Eurofound 2014a). Farmers hardly took a full weekly day off, while most farmers did take annual leave. While workers evaluated their work as quite hard (physically and psychologically), they were barely concerned about occupational health problems they could encounter in the future.

Overall **work satisfaction** was very good on all aspects, except regarding pay: Related satisfaction was modest for half of farms. Workers liked their job and felt supported, respected and recognized by their colleagues (if any). It has to be noted that internal rewards are lower for workers of the vegetable farm selling through the organic shop long chain, which includes far more employees.

### ***3.4. Consumers and the promise of quality products and consumer education***

As presented in Table 25, in the three chains (for this series of indicators, we could not make a distinction between the two products, and between the short and long organic shop chains), consumers trusted products in terms of food safety, appreciated their taste quality, and the information provided on products. However, on this latter aspect, consumers of CSAs and the organic shop graded products’ transparency lower than consumers of the webshop.

Participating in the three systems contributes to **consumer awareness**, with the organic shop performing less well than CSA and webshop systems in that aspect. That result highlights the role of the proximity with the producers.



Finally, the three systems performed very badly on **accessibility**, with low-age, low educated and low income people being under-represented among their consumers. At the same time, consumers rated the affordability of products well, especially in CSA chains.

#### **4. Results of type II LCIA: interpreting results by linking sustainability dimensions**

After the review of each indicator separately, we compared chains (actors) with each other's and with mainstream chains (actors), with the aim of identifying potential links between indicators and sustainability dimensions.

##### ***4.1. Ownership and controlled competition/commitment: useful but not necessary***

The analyses help make a clear distinction between VCAs with no formal obligations regarding sourcing (retailers, including big retailers and retailer co-ops; wholesalers,) and VCAs which structurally are meant to trade products from specific suppliers (producer co-ops). In the latter case, suppliers have secured outlets and they benefit from a controlled competition, and this brings also constraints for buyers. However, we have seen that ownership is not always necessary for a VCA to control competition within suppliers (e.g., as done by the webshop host) or to have a contractual commitment to each other (e.g., as done in CSAs, or by a VCA engaged in contract farming or in Fair Trade schemes).

##### ***4.2. Pricing: ownership, balanced governance or a trade-off with commitment***

By contrast, the type of ownership seems to have low impact on pricing mechanisms. The dairy co-op is owned by farmers; however, the latter remain price-takers and the price is market-based. There are also examples where there is no ownership relationship between VCAs and pricing that is more favorable to suppliers, as in the webshop, in CSAs and with the dairy wholesaler, where farmers were price makers (even if the price was market-based for the two latter cases). It is likely that pricing mechanisms rather rely on the market power of respective VCAs, and other factors.

In the case of the webshop, farmers and processors deal directly with individual final consumers. This could explain the high latitude they have to set their prices to, usually on the basis of their cost prices. In the case of the dairy co-op, even if it is owned by farmers, their power might be diluted given the size of the co-op. The dairy co-op has a dominant role on the market and farmers rely on it given the few other choices available for farmers to clear their milk, more than the dairy does (EMB 2012). However, it has to be noted that, the dairy is not in a position to offer prices which would be disconnected from market prices, given the markets it targets. The dairy focuses on volumes and targets remote markets: 20% of its conventional milk is sold to various retailers as drinking milk (50% for organic milk) and 80% is processed as powder and butter for exports or for the agri-food industry. Some other producer co-ops ensure a decent income to their suppliers, by focusing on quality rather than on quantity, such as the French Protected designation of origin (DOP) of Comté cheese, which has implemented a supply control mechanism and which is able to ask high prices for its farmers' product (Merel 2007). Whether pricing mechanisms are in favor of suppliers has thus rather a lot to do with targeted markets and internal co-op policy.

While wholesalers and retailers generally negotiate prices with their suppliers, two of our samples did not negotiate prices when they dealt with individual primary producers or small processors. There, market power does not play a role, and it is rather ethical values that drive these actors not to impose or negotiate prices.

In the case of CSAs, farmers are price makers, but prices are market-based. We may thus ask about the supposed balance of the relationship, with a farmer alone in front of a group of consumers. However, other factors might come into play. The difficulty to calculate cost price is real for small-scale diversified farmers, who often do not even know the quantity they produce. Also, CSA farmers want to offer affordable vegetables to their consumers. In the last years, the turnover within groups is quite high, and consumers have many other choices available on the market to get organic products, contrary to 10 years ago. Also, it is likely that farmers are afraid to lose clients, especially clients with whom they have social ties and who commit on quantities. With market prices, farmers set their prices on a comforting basis, which is the same as their colleagues.

This brings us to the hypothesis that the extent to which buyers commit to their suppliers has a role to play in the way that prices are set: In other words, the constraints for buyers stemming from committing towards other VCAs seem to be managed through pricing. In fact, the comparison of transaction modalities between assessed chains indicates that the more the buyer commits towards its suppliers, the less pricing will be in favor of suppliers. This trade-off between commitment and price is to be found in every transaction of our assessed chains, as illustrated in Figure 25.



Figure 25. Trade-off between commitment and fair price in transaction with farms.

The dairy co-op commits to buy milk of its member for an indefinite period, and it has to find outlets for its members, including on foreign markets. Farmers have a complete and secure outlet, but in return farmers do not have their say on prices. At the other end, farmers selling through the webshop seem to set their price with more freedom than CSA farmers do. As a webshop farmer said: “I set my price, and clients buy or do not buy!” In-between, transaction modalities combine and balance different levels of commitment and modes of pricing, adjusting to market realities with quantity or prices.

#### 4.3. Transaction modalities, profitability and use of other gainful activities

According to our theoretical framework, none of the chains provide all the necessary conditions for the value to be captured fairly by each VCA, especially farms, since chain governance and transaction modalities (commitment and/or pricing) are generally not in their favor. However, given the fact that

almost all farms work with different clients, it is not possible to conclude on a link between profitability and transaction modalities, which vary according to clients, as our assessment shows.

As a general comment, we notice that while intermediaries set their price based on cost prices (contrary to most farms, within assessed chains), all of them, apart from the organic shop, are profitable (contrary to around half of farms). This would place price fairness as a decisive element for VCAs to be profitable. Three dairy farms (selling respectively through CSA, the organic shop short chain, and the organic shop long chain) out of six (for which data is available) were profitable. For vegetables, three farms (selling respectively through CSA, a webshop and an organic shop, long chain) out of seven were profitable. Among those three farms, one might have been more competitive than the others: It grew vegetables on a medium scale, in a conventional manner, in the country area specialized in market gardening. The two other farms conducted the important activity of purchase and resale (on markets) besides production activity. As noted by a recent study on the sector, “This strategy [of conducting such an activity besides production] is necessary to the functioning of agro ecological medium-scale farms” (Dumont 2017). We might thus question the profitability of production activities of those farms as well. The study also highlights that purchase and resale activities allow farmers of this kind (medium-scale agro ecological) to provide, as well, quite good employment conditions to its workers in comparison to other vegetables farms.

#### ***4.4. Profitability and employment conditions: a complex relationship***

This brings us to the issue of employment conditions which appear to rely heavily on VCA profitability: VCAs that provide good employment conditions only (most intermediaries, some farms) are profitable VCAs. Profitability seems thus a necessary condition for employment conditions to be good to workers.

For dairy farms, it seems that profitability is even a sufficient condition, since those which are profitable provide good employment conditions, and poor employment conditions are found only in unprofitable farms. This is not the case on profitable vegetable farms, which do not all provide good employment conditions: Some of them offer subsidized daily contracts more than non-profitable farms do. In Belgium, specific subsidized daily contracts (Carte cueillette/Plukkaart and ALE/PWA/wijk-werken) are available for farming seasonal activities (e.g., sowing, harvest), that can be activated more easily by market gardeners. In this context, market gardeners seem to use these contracts as part of strategies to remain profitable.

However, such subsidized contracts entail setbacks. For farms to be profitable, public authorities support the funding of unstable contracts, at the expense of workers. Furthermore, as pointed out by a farmer, those contracts were actually designed for conventional farms specialized in the production of a few vegetables (which represent most vegetable farms in Belgium). Diversified farms, such as the ones selling through CSA have then fewer opportunities to reduce labor costs, even if it is not necessarily their objective to do so.

In conclusion, profitability is a necessary condition to maintain or create quality jobs. Moreover, the link between profitability and the quality of employment conditions is bilateral rather than unilateral, and employment conditions are influenced by other factors such as the regulatory context. In the case of subsidized daily contracts, we may ask whether these farms would get through without the use of these contracts, and whether the regulatory framework stimulates poor employment conditions.

#### ***4.5. Work conditions and hardness, financial and other rewards***

Overall, on farms, work is hard, as testified by the excessive working time and feeling of farm workers. However, workers like their jobs, and farmers feel recognized and understood, which is quite uncommon in the industry, or quite against common beliefs about the farming occupation. For a number of farms in our sample, rewards were not financial. It is likely that the relationships that farmers find in those chains play a positive role. Also, the small scale of farms and their rather ecological production methods are likely to bring more recognition on the client side and pride on the farmer's side, in comparison with large-scale conventional farms.

#### ***4.6. Impacts on the consumer side and the role of proximity with producers***

Following the results of the assessment on each product's transparency and awareness raising (which are lower by consumers of the organic shop), we can deduct that the proximity between producers and final consumers might play a positive role, particularly when they meet regularly, as with the webshop system.

#### ***4.7. Financial and professional insecurity of farmers versus affluence of consumers***

While half of the farmers do not earn a living wage and employment conditions are quite poor, consumers of the AFNs belong to upper-educated and upper-income classes. At the same time, final consumers find products affordable, especially in CSA chains. This result could be linked to the number of intermediaries in the chain but also to the mechanisms used to set prices, that are based on market-prices (except for the webshop farms).

#### ***4.8. ... A lever to improve the sustainability of AFN products?***

There is thus a potential for farmers to take the flexibility to set and impose prices covering costs, decent income to farmers and fair employment conditions for workers. A recent survey among Belgian consumers reports that 75% think that farmers do not earn enough and 60% and 48% are ready to pay more for vegetables and animal products, respectively (Collège des producteurs 2016). AFN's consumers include affluent and highly educated consumers, whose awareness is raising through their participation with respective AFNs. There is, thus, a high potential for these actors to accept fairer and potentially higher prices. On their side, some retailers and wholesalers already do not negotiate prices when they deal directly with farmers. It would then be up to farmers to set prices that allow them to get a decent income and to provide good employment and working conditions, and to consumers to accept those prices. However, for this to happen, there would need a mindset change, disposable technical tools to calculate cost prices for farms, but also the right incentive to offer good quality jobs, rather than the 'low-cost' working arrangements that prevail today.

## 5. Discussion and conclusions

### *5.1. What can we conclude from this case study about the role of chain governance? Insights for other and mainstream chains and for S-LCA practice*

Products from mainstream chains are said to involve many negative social impacts, such as poor working conditions, low income in upstream nodes of product chains, and consumer distrust. In many aspects, products from the four assessed AFNs seem to make a difference in comparison to products from mainstream chains (including on consumer impacts, work satisfaction, recognition felt and retailer governance). However, when looking upstream, these alternative chains reproduce some of the peculiarities of mainstream chains, with the use of dominant wholesalers, the presence of similar bottlenecks, the lack of commitment and the negotiation of prices. Given that chain governance and the transaction modalities, it is not surprising that profitability and employment conditions do not seem to be better in those chains than in mainstream chains.

While AFNs do not necessarily perform better than mainstream chains in those latter aspects, we can conclude that the way that chains are governed is decisive for the social sustainability of products, including through implications on transactions modalities. A more balanced and participatory governance is helpful for transactions modalities to be more in favor of upstream VCAs. But, the practice shows that it is not sufficient (transaction modalities are never fair in any of the chains as they never combine fair price and commitment for primary producers), nor it is a prerequisite (some VCAs that do not have a democratic governance conduct transactions in a fairer way than democratic VCA).

The issue of price fairness appears to be quite decisive for profitability of VCAs and good employment conditions to be realized. While we could not verify the effective fairness or unfairness of prices (cf. 2.1), this is reflected in poor profitability and employment conditions which arise almost only in farms, whereas downstream nodes do not encounter these issues, while their prices are based on cost prices (with the exception of the organic shop). From this, we can deduct that commitment between VCAs is less decisive (maybe because the variability of ordered volume is not that high, but this should be checked<sup>36</sup>). It is difficult to achieve together with price fairness anyway.

We deduced those conclusions from one case study considering a small sample of VCA. However, our results confirm our main assumption that chain governance matters for the social sustainability of products, that itself comes from analysis of the global commodity chain approach and from civil society claims (e.g., the Fair Trade movement).

We would thus recommend S-LCA practice to consider those aspects relating to chain governance and transaction modalities (i.e., subcategories relating to value chain actors in the Guidelines for S-LCA and other not included assessment criteria) a priority when assessing the social sustainability of products. At least, this would allow an increase in knowledge on the functioning of product chains and underlying mechanisms, and potentially to confirm/refute the results of this case study. When confirmed, clear recommendations could be done to address main sustainability issues linked to products' life cycles, including poor employment and working conditions, and unfair distribution of value along the chain.

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<sup>36</sup> The criteria "Stability of trading relationship" was included in our framework (cf. part 1 of this article; (Sureau et al. 2019b); chapter 5) (ILO 2015); however, we could not assess it in this case study.

## ***5.2. How efficient and relevant our methodological proposals are to assess and understand the social sustainability performances of products?***

The framework used and related criteria and indicators have proven to be able to describe precisely the functioning of products chains, their actors and relationships. We could also highlight social hotspots, positive and negative, but also identify relationships between indicators, potential causes of problems and possible improvement levers. In this regard, the participatory approach used to build the framework and the theoretical framework (drawn from global commodity chain analysis) used to structure the framework prove their relevance. Also, the use of a type II LCIA, in addition to a type I/reporting LCIA brings clear benefits and an analytical approach to the mere description of results.

However, this analytical work is based on a qualitative analysis which would certainly need quantitative grounds for the identified causal mechanisms to be confirmed. For this, a similar assessment should be implemented to a much larger sample. However, this would require considerable data collection work, since data for most indicators cannot be found in statistics and the access too such sensitive data could hamper this task. Also, it would imply restricting the analysis to a much smaller set of indicators.

As a conclusion, we would recommend further S-LCA researches to combine type I and type II assessments, which are both useful in S-LCA. As already argued (Sureau et al. 2019; chapter 2), Type II assessment would clearly benefit from the support of theories in social sciences and other disciplines in order to identify causal mechanisms to be investigated, especially those looking at root causes of main social problems in product chains. On the investigation part, our work shows that a qualitative analysis brings interesting results, that would be reinforced by a more robust, quantitative analysis. Quantitative analysis of this type has already been implemented to study product chains; e.g. (Locke 2013). However, the access to such sensitive data as transaction modalities and profitability on a large scale is unlikely.

## Supplementary material 6

Table 16: List of criteria, indicators and reference points

Criteria		Indicators	Reference Points
<i>Chain/VCA Governance</i>			
Chain governance and relations between VCA	Chain length	Number of intermediaries between primary producer and final user	A. 0 B. Maximum 1 C. More than 1 D. More than 2
	Level of control of the organization	Actual ownership	B. Most of the capital is owned by users of the organization (partners, workers, clients, suppliers) C. Most of the capital is owned by investors D. The company is quoted on the stock exchange
	Participation of other VCA in decision making	Actual and potential ownership by other VCA	A. All capital owned by other VCA and shareholding open under conditions (e. g. producer co-op) B. Other VCA own part of the capital and shareholding open and supported (co-op) C. Other VCA might own part of the capital but shareholding by other VCA not supported or open
	Competition management	Buying obligations towards certain suppliers	A. The purpose of the organization is to buy and sell all the supply of certain suppliers (usually its members) B. The purpose of the organization is to buy and sell products of certain suppliers in priority C. The organization has no obligation regarding sourcing
	Market power of the organization	Size of organization and market concentration	A. Small organization in a low concentrated market B. Small organization in a concentrated market C. Big organization (< C8) in a concentrated market D. Very big organization (<C4) in a concentrated market
	<i>Transaction modalities</i>		
	Commitment between VCA	Contract between the buyer and the supplier	A. Very high commitment (open-ended or with risk sharing) B. Formalized contract on several months at least C. Non-formalized commitment D. No commitment or commitment with penalties if non-compliance
	Price fairness	Pricing mechanism (1): Who sets the price?  (2): Basis to set the price	B. The supplier C. The price is negotiated D. The buyer  B. On the basis of cost price C. On the basis of market or competitor's price, adapted according to specific costs, or with a multiplying factor D. On the basis of pure market price
	Unfair trade practices	Payment term	A. Within 7 days B. Within 30 days C. Within 3 months

D. After 3 months		
<i>Social Ties Felt by VCA</i>		
VCA	Trust in the trading relationship	Whether the supplier feels that it trusts the reliability of the trading relationship with the client/that it will continue (1. I do not trust it at all, 5. I trust it absolutely) A. $x \geq 4$ B. $3 \leq x < 4$
	Recognition between VCA	Whether the supplier feels recognized and valued for his/her work by the client C. $2 \leq x < 3$ D. $x < 2$
	Understanding of each other's reality	Whether the supplier feels that the client understands his/her reality/difficulties
	Profitability and autonomy of VCA	
	Profitability of VCA	Takings - income/ year B. For sole proprietorship: if the generated income/capita is above the Belgian living wage; for companies: if profit before tax is positive C. For sole proprietorship: If the generated income is below the Belgian living wage; for companies: If profit before tax is negative
		Use of other gainful activity B. No, C. Yes (including purchase and resale activity)
<i>Employment conditions</i>		
Workers	Social benefits/ social security	Provision of contracts with full benefits/ employee contracts to workers (other than partners) A. Provision of some permanent employee contracts B. Provision of some temporary employee contracts C. Non provision of any jobs D. Non-provision of any employee contracts
		Use of 'low-cost' worked hours (subsidized and daily contracts, disguised employment/'false' self-employed person, non-paid familial labour, or non-declared) B. Non-use (except trainees) C. Use for some worked hours D. Use for most worked hours (outside of hours worked by partners)
	Stability of work contracts	Use of unstable contracts/arrangements A. Use of open-ended contracts only B. Use of open-ended contracts mainly C. Use of temporary employee contracts for more than 10% of worked hours (outside of hours worked by partners/managers) D. Use of daily contracts (incl. temporary work) or self-employed persons
	<i>Working conditions</i>	
	Working time	Excessive work hours per week A. Equivalent or less than 38 h a week B. Less than 48 h (max allowed in agriculture) C. Between 48 and 68 h a week D. More than 68 h a week



		Possibility to have weekly days off	B. At least 1 day a week C. 1/2 day a week D. No day off
		Possibility to take annual leave	B. Yes C. No
	Work hardness	Feeling of workers regarding psychological and physical work hardness	
		Concerns of workers regarding potential future occupational health problems	A. $x \geq 4$ B. $3 \leq x < 4$
	Work satisfaction	Feeling of workers on general satisfaction, autonomy, learning, relations with supervisor and colleagues, work recognition, work-life balance and pay	C. $2 \leq x < 3$ D. $x < 2$
	<i>Product's Quality and Transparency</i>		
	Food safety	Trust of consumers regarding food safety	
	Taste	Satisfaction of consumers regarding taste quality	A. $x \geq 4$ B. $3 \leq x < 4$
	Product's transparency	Satisfaction of consumers regarding the information provided on the product and on production methods	C. $2 \leq x < 3$ D. $x < 2$
Final consumers	<i>Product's accessibility</i>		
	Product's affordability	Satisfaction about product affordability	A. $x \geq 4$ B. $3 \leq x < 4$ C. $2 \leq x < 3$ D. $x < 2$
	Accessibility to vulnerable people	Representation of young, low educated, and low income people among consumers	A. Upper representation of targeted people in comparison to the regional mean (>5 points more/regional mean) B. Equal representation (+/- 5 points difference) C. Lower representation (>5 points less) D. Very low representation (>15 points less)
	<i>Awareness raising on sustainability issues</i>		
	Consumer education	Feeling of consumers regarding the evolution of their awareness on sustainability issues, since they buy the product through the channel	A. $x \geq 4$ B. $3 \leq x < 4$ C. $2 \leq x < 3$ D. $x < 2$

## Supplementary material 7: Results tables

Table 17: Results regarding transaction modalities for fresh vegetable chains





Criteria/Indicator	Farm 	Wholesaler 	Retailer 	Final consumer 
Commitment between VCA	A			CSA
Who sets the price?	B			
On which basis?	C			
Payment term	B			
Commitment between VCA	D			Web-shop
Who sets the price?	B			
On which basis?	B			
Payment term	A		A	
Commitment between VCA	D			Organic shop short chain
Who sets the price?	B		B	
On which basis?	C		B	
Payment term	B		A	
Commitment between VCA	C	D		Organic shop long chain
Who sets the price?	C	C	B	
On which basis?	C	B	B	
Payment term	B	B	A	
Commitment between VCA	A	D		Mainstream chain
Who sets the price?	D	D	B	
On which basis?	D	B	B	
Payment term	B	C/D	A	

Table 18: Results on transaction modalities for drinking milk chains







Criteria/Indicator	Farm 	Co-op 	Processor 	Wholesaler 	Retailer 	Final consumer 
Commitment between VCA	B					CSA
Who sets the price?	B					
On which basis?	C					
Payment term	A					
Commitment between VCA	D					Web-shop
Who sets the price?	B					
On which basis?	B					
Payment term	A					
Commitment between VCA	D					Organic shop short chain
Who sets the price?	B			C	B	
On which basis?	C			B	B	
Payment term	B			B	B	
Commitment between VCA	A	A	D	D	D	Organic shop long chain
Who sets the price?	D	Nap	C	C	B	
On which basis?	D	B	B	B	B	
Payment term	B	B	B	B	A	
Commitment between VCA	Nav	B			D	Mainstream chain
Who sets the price?	D	C			B	
On which basis?	C	B			B	
Payment term	B	C/D			A	

Table 19: Results on social relations between VCAs for fresh vegetables chains




Criteria/Indicator	Farm 	Wholesaler 	Retailer 	Chains		
Trust in the trade relationship	[3.5–4]			CSA		
Felt recognition	[4–5]					
Felt understanding	[3.5–4]					
Trust in the trade relationship	[4.5–5]		5	Web-shop		
Felt recognition	[3–5]		5			
Felt understanding	[3–5]		4			
Trust in the trade relationship	5		Nap	Organic shop chain	shop	short
Felt recognition	5		3			
Felt understanding	5		2			
Trust in the trade relationship	4	3	Nap	Organic shop long chain		long
Felt recognition	5	2	3			
Felt understanding	3	2	2			

Table 20: Results on social relations between VCAs for drinking milk chains





Criteria/Indicator	Farm 	Co-op/ processor 	Wholesaler 	Retailer 	Chains
Trust in the trade relationship	[3–5]				CSA
Felt recognition	[4–4.5]				
Felt understanding	[3–4]				
Trust in the trade relationship	5				Web-shop
Felt recognition	[4.5–5]				
Felt understanding	[4–5]				
Trust in the trade relationship	4		4	Nap	Organic shop short chain
Felt recognition	4		4	3	
Felt understanding	4		3.5	2	
Trust in the trade relationship	5	5	4	Nap	Organic shop long chain
Felt recognition	5	4	4	3	
Felt understanding	5	2	3.5	2	

Table 21: Profitability and employment conditions for fresh vegetables chains




Criteria/Indicator	Farm 	Wholesaler 	Retailer 	Chains
Profitability/farmer income (market share)	C (100%)/C (80%)/B (50%)			CSA
Farms: use of other gainful activity	B/C/C			
Provision of contracts with full benefits	C/C/D			
Use of 'low cost' worked hours	B/D/C			
Use of unstable work contracts	Nap/Nap/D			
Profitability/farmer income (market share)	B (30%)/C (30%)		B	Web-shop
Farms: use of other gainful activity	B/B		Nap	
Provision of contracts with full benefits	A/D		A	
Use of 'low cost' worked hours	C/D		B	
Use of unstable work contracts	D/D		Nap	
Profitability/farmer income (market share)	C (15%)		C	Organic shop short chain
Farms: use of other gainful activity	B		Nap	
Provision of contracts with full benefits	A		A	
Use of 'low cost' worked hours	C		C	
Use of unstable work contracts	C		C	
Profitability/farmer income (market share)	B (2%)	B (<5%)	C	Organic shop long chain
Farms: use of other gainful activity	C	Nap	Nap	
Provision of contracts with full benefits	A	A	A	
Use of 'low cost' worked hours	B	B	C	
Use of unstable work contracts	C	B	C	

Table 22: Profitability and employment conditions for drinking milk chains






Criteria/Indicator	Farm 	Co-op 	Processor 	Wholesaler 	Retailer 	Chains
Profitability/farmer income (market share)	B (14%)/C (25%)/C (33%)					CSA
Farms: use of other gainful activity	B/B/B					
Provision of contracts with full benefits	A/D/D					
Use of ‘low cost’ worked hours	B/D/D					
Use of unstable work contracts	B/D/D					
Profitability/farmer income (market share)	C (60%)/Nav (30%)/Nav (20%)			B		Web-shop
Farms: use of other gainful activity	B/B/B			Nap		
Provision of contracts with full benefits	D/A/Nav			A		
Use of ‘low cost’ worked hours	D/B/Nav			B		
Use of unstable work contracts	Nap/B/Nav			B		
Profitability/farmer income (market share)	B (19%)			B (12%)	C	Organic shop short chain
Farms: use of other gainful activity	B			Nap	Nap	
Provision of contracts with full benefits	A			A	A	
Use of ‘low cost’ worked hours	B			B	C	
Use of unstable work contracts	B			B	C	
Profitability/farmer income (market share)	B (97%)	B (<1%)	B (<1%)	B (12%)	C	Organic shop long chain
Farms: use of other gainful activity	B	Nap	Nap	Nap	Nap	
Provision of contracts with full benefits	C	A	A	A	A	
Use of ‘low cost’ worked hours	B	B	B	B	C	
Use of unstable work contracts	Nap	B	B	B	C	

Table 23: Work conditions and satisfaction in farms for vegetables chains. \* Regards partners only.

Criteria/Indicators	CSA	Webshop	Organic Shop Chain	
			Short	Long
Excessive work hours *	A/C/D	D/D	D	C
Weekly days off *	B/B/C	D/B	C	D
Annual leave *	B/B/B	B/B	B	B
Physical hardness	4/2/2	[2-3]/[3-5]	2	[1-4]
Psychological hardness	3/3/4	[3-4]/[2-5]	2	[2-5]
Concerns for occupational health problems	5/3/4	[3-5]/[3-5]	3	[2-5]
General work satisfaction	5/5/4	[4-5]/5	4	4
Variety of tasks	5/4/4	[4-5]/5	5	[3-5]
Autonomy	5/5/4	[4-5]/5	5	[3-5]
Possibility of continuous learning	Nav/5/4	[4-5]/5	5	[2-4]
Respect and fair treatment by the supervisor	Nap/Nap/Nap	Nap/5	Nap	[4-5]
Support from colleagues	Nap/Nap/4	[4-5]/[4-5]	4	[4-5]
Recognition of the work by colleagues	Nap/Nap/5	[4-5]/[4-5]	3	[4-5]
Work-life balance	Nav/4/3	[3-5]/[-]	2	Nav
Work satisfaction/pay	3/2	[3-4]/[2-5]	Nav	[2-5]

Table 24: Work conditions and satisfaction in farms for drinking milk chains. \* Regards partners. only.

Criteria/Indicators	CSA	Webshop	Organic Shop Chain	
			Short	Long
Excessive work hours *	C/D/C	D/D/C	C	C
Weekly days off *	B/C/B	[B-D]/[B-C]/B	B	C
Annual leave *	B/B/C	B/B/B	B	B
Physical hardness	3/[2;3]/2	[2-3]/[1-3]/4	3	3
Psychological hardness	2/[3;4]/3	3/[1-3]/4	2	3
Concerns for occupational health problems	4/[4;5]/2	[1-5]/[3-5]/4	4	3
General work satisfaction	5/[4;5]/3	5/[3-4]/5	5	4
Variety of tasks	4/5/4	[4-5]/[4-5]/4	4	3
Autonomy	4/5/4	4/5/4	4	4
Possibility of continuous learning	5/5/4	[3-4]/5/3	5	3
Respect and fair treatment by the supervisor	Nap/Nap/4	Nap/Nap/Nap	Nap	Nap
Support from colleagues	4/5/2	5/[4-5]/5	4	2
Recognition of the work by colleagues	4/5/3	5/4/5	4	3
Work-life balance	Nav/4/3	5/Nav/Nav	Nav	3
Work satisfaction/pay	4/2/4	1/[3-4]/2	4	4

Table 25: Results on product's quality, affordability, accessibility and consumer education

Criteria/Indicators	CSA	Webshop	Organic Shop
Food safety	A	A	A
Taste	A	A	A
Product's transparency	B	A	B
Product affordability	A	B	B
Accessibility of products to vulnerable people:			
Representation of young people (under 25)	D	D	D
Representation of low educated people	D	D	D
Representation of low income people	C	D	C
Consumer education	A	A	B



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## CHAPTER 7: How does price fairness matter? An assessment of milk traded under the Biomilk North/North fair trade initiative

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### 1. Introduction

The previous chapter 6 comparing products traded under different governance modalities along their life cycle brings important results. Particularly, it highlights **the importance of price setting mechanisms** for the social sustainability of products. According to our analysis, the use of **market-based pricing by the assessed AFNs chains would be problematic, and would imply low profitability and income for farmers, with potential implications for employment and working conditions on farms**. This analysis concurs concerns and claims expressed in the farming sector (cf. 1.1). However, in chapter 6, it was not possible to verify the effective unfairness of prices, i.e. whether prices paid to value chain actors cover the cost price and a decent income for all workers, and neither was it possible to calculate what would be a fair price, where appropriate (cf. 2.1 of Chapter 6).

To study this, we developed another application with a case study on a production chain that puts **price fairness as a central issue**. This chain, that we call the Biomilk chain, is **a case of local or North-North fair trade** (cf. Box 5). **The producer co-op Biomilk.be** seeks explicitly to provide an outlet “at best conditions” and a fair and stable price to its members (cf. 1.2 below). According to the Fair trade movement, stable and fair trading relationships are seen as a prerequisites to reduce detrimental environmental and social impacts (cf. box 2.2.2 of the Introduction).

#### *Box 5: North/North or local Fair trade*

While the fair trade movement was historically directed towards marginalized producers from the South, a new trend is emerging within the movement: the local fair trade. The worldwide food price crisis has also shed light on difficulties occurring in Northern countries, and the movement recognized that “challenges faced by marginalized producers in the Global South are also faced by marginalized producers in the Global North. Family and peasant farming has to deal with unfair competition of big agribusinesses, too low wages, income insecurity due to speculation on agricultural commodities stock market” (WFTO-Europe 2018).

In this way, Belgian and French fair trade federations have now as members local producers or producer co-ops and companies that process and trade local product (BFTF n.d.; Commerce équitable France n.d.), and this principle is recognized by the European chapter of the World fair trade Organization (WFTO-Europe 2018).

This development has even been taken up by governments: a French law<sup>37</sup> « extends the definition of Fair trade to relations with any producers, including in France”. Accordingly, fair trade is defined a relationship providing/ including: (i) Income-generating prices, based on production costs and a balanced trading relationship; (ii) a multiyear commitment between producers and buyers; (iii) the payment of an additional premium to finance collective projects; (iv) an autonomy for farmers through a democratic governance in their organization; (v) Transparency and traceability in chains; (vi) Awareness raising of consumers on socially and ecologically sustainable production modes (Commerce équitable France n.d.). In France, local fair trade amounts 434 € million of sales in 2018, with a 34% yearly increase, and benefits to 65 producer groups, i.e. around 8000 farms (Commerce équitable France n.d.). The Walloon region has set up a “fair price” label in 2016<sup>38</sup>, in order to differentiate products and initiatives seeking to provide fair prices, and more generally fair trading practices, to local producers. Since 2018, around thirty products have received the label (Collège des producteurs n.d.).

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<sup>37</sup> « Loi sur l'Economie Sociale et Solidaire » in French

<sup>38</sup> “Label prix juste” in French.

Looking at the functioning and potential impacts of this initiative on farms is thus particularly relevant. At the same time, looking at price fairness, thus at a rather economic indicator, opens up other methodological issues that are until now mainly referred under Economic-LCA, extended Life cycle cost (LCC), or the third pillar of Life cycle sustainability assessment (LCSA) (Neugebauer 2016; M.R. Hall 2015; Wood and Hertwich 2013) (cf. 1.3 below). According to our S-LCA framework, the issue of price fairness would however fit S-LCA, as a potential driver of social and socioeconomic impacts.

The main methodological objectives of this chapter are thus to integrate in S-LCA a quantitative indicator assessing price fairness (i.e. an indicator derived from LCC but that goes beyond costs) and to check how this contributes to the social sustainability assessment of a food product (cf. 1.3.2). At an empirical level, we want to verify the social sustainability of milk traded under a local Fair trade chain and at the same time the role of price fairness (together with other chain governance and transaction modalities aspects) for employment and working conditions along product chains (cf. 1.2).

### ***1.1 Rationale: The issue of price fairness in the milk industry***

The fairness of agricultural prices is a highly discussed issue, especially in the milk industry, but not only, milk being an emblematic product of an issue affecting potentially every agricultural crop/product.

#### **Volatile prices and unequal distribution of added value especially for primary producers**

Indeed, agricultural prices rely on supply and demand and face volatility, more than processed products, given the upstream position of commodities in production chains that makes demand price inelastic. With the subsequent reforms of the EU Common agricultural policy, including the decomposition of the intervention mechanism in the dairy sector after the 2003 Luxembourg Reform and the progressive removal of dairy quotas during the 2008-2015 period, European dairy farmers face this issue even more frontally. Between 2006 and 2016, Belgian milk production increased by 26% and dairy farmers face important price variations, as illustrated by the 2009 "milk crisis" and the liters of milk thrown on Belgian fields (Lebacqz 2015; BCZ-CBL 2017; Mondelaers et al. 2014).

Yet, this price volatility at the primary production level transmits to a small extent only to the processing level, and does not transmit at all at the retail level, as shown by an analysis of the Belgium dairy chain over the 2006-2014 period (Observatoire des prix 2014). It seems even that chain actors face contrary mid-term trends in terms of prices: according to a complementary analysis of the French dairy chain over the 2001-2016 period (cf. Figure 26), gross profit indicators<sup>39</sup> of retailers and processors navigate on an upward trend, while the average consumer gate price increases<sup>40</sup>, but prices paid to the producer remain around the amount of 0,25 €/liter of milk<sup>41</sup> (OFPM 2017). This is despite the increased costs that have to be borne by dairy farms (e.g. in Belgium, between 2006 and 2014, +70% of price increases for feed, +33.5% for seeds and plants, +60% for fertilizers, +54% for energy) (Observatoire des prix 2014).

As argued by the GCC framework (cf. chapter 5) those unequal trends would come from the unequal power relationships that govern transaction modalities in milk value chains, and more generally agricultural value chains, with the few downstream actors in the chain that control the market and that take increasingly the lion share of cumulated added value (BASIC 2019). In Belgium, as a consequence of a large move of merges and acquisitions in the last decades, the four biggest dairies share out more than 80% of the dairy collection and the three biggest retailers share out 65,4% of food retail

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<sup>39</sup> I.e. the difference between sale price and cost of raw materials/inputs.

<sup>40</sup> The increase is also due to the increase in organic milk sales which price is higher.

<sup>41</sup> half-skimmed UHT drinking milk



(Observatoire des prix 2014). In the organic market sector, four to five actors share out the dairy collection and processing, for a much smaller market though (BioForum Vlaanderen 2018).

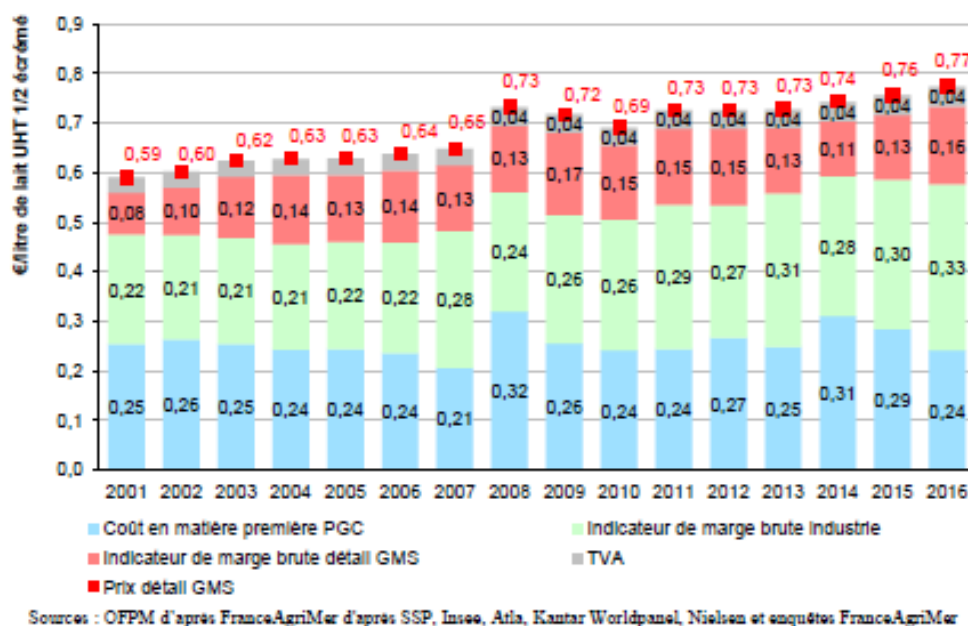


Figure 26: Composition of the yearly average retail price (middle and big retailers) of average half skimmed UHT drinking milk in raw material and gross profit indicators of processors and retailers

### Price (un)fairness and its subsequent social and socioeconomic effects

While the unbalance between value chain actors is obvious, how is it when looking at absolute figures, i.e. at the price fairness at the level of farms precisely? The European Milk Board, a lobby for milk producers in Europe, finds that only 73 % of cost prices (including farmer's income) of Belgian (conventional) dairy farms are covered by producer prices on the 2013-2018 period, and a similar gap is found in neighboring countries (EMB 2018) (cf. Table 26).

Table 26: Milk production costs and farm gate prices in 2016 in 5 EU countries (BAL/EMB 2016)  
Note: in cents per kilogram

Milk-producing countries:	Belgium	Denmark	France	Germany	Netherlands
Production costs (end total)	41.37	39.77	44.49	41.17	42.66
Farm gate price	26.70	28.68	30.18	27.93	28.75
Cost shortfall	35%	28%	32%	32%	33%

This gap between producer prices and cost prices can be observed when looking at farm's profitability and incomes. Over the period 2006-2012, revenues of dairy farms make it to cover costs (gross operating result being positive), but not farmer income (net operating result being negative), in Flanders and in Wallonia. In parallel, the same analysis finds that gross profit is the highest for retailers, followed by dairy wholesaler and processor (Observatoire des prix 2014).

More recent and precise figures for 2014–2016 specify that incomes per labor unit of Walloon farms amount, on average, to 15 260 € per year, with significant differences based on years, from €27,117 in 2014 to €6,391 in 2016. Additionally, the distribution of incomes is very unequal, with 56% of Walloon

farms earning less than €15,000 per labor unit per year, with dairy and mixed farms being one of the least profitable farms among Belgian farms<sup>42</sup> (SPW Agriculture 2018).

Against this background, it is no surprise that poor employment conditions prevail in farms, with non-standard forms of employment, especially for migrant seasonal workers, as well as poor working conditions, with widespread excessive work hours and increased health risks (cf. more details in the introduction of chapter 3).

In a few decades, the number of dairy farmers and dairy herd has declined substantially (-68% and -48% respectively between 1990 and 2012 in Wallonia), resulting in an increase in farm size (+67% of dairy cows per farm) and changing the agricultural landscape (Lebacqz 2015).

### **A rising number of initiatives on price fairness**

The acuteness of the price fairness issue in the milk industry (and other agricultural industries) has led public authorities to take actions, such as the measures decided in the French Egalim law (cf. Introduction of chapter 3) and the Walloon fair price label (cf. Box 5 of the present chapter).

In parallel, a number of private initiatives emerged in Europe, driven by farmers (such as EMB fair milk initiative in 7 European countries) or by consumers (such as the milk “C’est qui le patron” in France and Belgium) (EMB n.d.; La société des consommateurs n.d.). In France, Biolait, who aims to provide a stable and unique price to all its members, collects 30 % of French organic milk; part of this milk is then sold to consumers as ‘fair trade milk’ in shops of the main organic retailer in France (Biocoop) (BASIC 2019).

In Belgium, several fair trade initiatives in the milk sector emerged in the last decades but most of them faced several barriers in their development. The first one, Biodia (organic milk), had to stop the production after two years because of new requirements imposed by its dairy, and the second one, Fairbel (conventional milk), could not find a Belgian dairy to process its milk from the beginning and has to rely on a dairy located in Luxembourg processing milk from Luxembourgish farmers. A third initiative, founded in 2002 is however still working and developing: the Biomilk producer co-op.

## ***1.2 The Biomilk initiative and our empirical objective***

### **The chain of Biomilk, an Alternative food network**

Biomilk was founded by 23 Flemish dairy farmers because their collector stopped the collection round. At that time, organic dairy farmers were rare, especially in Flanders, and none of the Flemish dairies collected organic milk as such (Vercauteren 2006; Duchesne 2006). In 2006, Walloon farmers joined the co-op because of a disagreement over a change in the status of their former dairy (which got merged with another one). In 2020, the co-op counts around 40 members spread over Belgium and trades around 20 million liters of milk per year.

The Biomilk chain is a relevant application domain for our issue of interest on several aspects. First, it can be characterized as an Alternative food network (AFN), using the characteristics identified by (Forssell and Lankoski 2014) (cf. Introduction of 3<sup>rd</sup> part). Second, there is an increased requirement for products and production, since members of the co-op are organic farms only. Third, the distance between producers and consumers is aimed to be reduced since the milk is processed and sold on the Belgian market mainly, hence “contributing to the support to local economy”. Thirdly, the producer co-op aims explicitly to provide fair prices to its members, as a new or alternative form of market

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<sup>42</sup> excluding farms with a turnover of less than €25,000.

governance. As stated on their website, the mission of the co-op is to valorize the milk of their member at the best conditions, to offer a guaranty to the members over the outlet at a price that is stable and covers their costs (Biomilk.be n.d.).

Even if the organic dairy market is still small (2.7% of Belgian dairy consumption in 2015), the producer co-op is rather an important actor within a growing industry, since it collects 25 % of the Belgian organic milk (BioForum Vlaanderen 2018). The other four dairy collectors in Belgium are two private dairies<sup>43</sup> and two other producer co-ops<sup>44</sup>. While those collectors provide certainly a secured outlet to their farmers, the Biomilk producer co-op distinguishes itself from other collectors by its objective to provide a fair price to its members and to supply mainly local markets.

### **Verifying sustainability claims of an Alternative food network**

Continuing the exercise of verifying sustainability claims of AFNs, we want to verify the assumption that products traded under a North-North fair trade chain are socially sustainable or more sustainable than products traded under mainstream chains, according to the criteria defined in our S-LCA framework (cf. chapter 5). More particularly, how are profitability/income and employment conditions in Biomilk farms? How different from mainstream chains are chain governance and transaction modalities in the Biomilk chain, especially on pricing? To which extent are prices fair, i.e. how far do they cover cost prices and decent incomes for farmers, as defined by the Fair trade movement (cf. Box 1, introduction)?

### ***1.3 Methodological objectives***

As already outlined in Chapter 5, our framework goes beyond the scope of most S-LCA frameworks and studies and include criteria and indicators on value chain actors themselves, in particular on their economic situation (e.g. price fairness, profitability/incomes of farmers).

In the framework of LCSA, economic aspects are generally limited to the calculation of costs along the life cycle of products and services through Life cycle costing (LCC). However, the use of LCC as the economic pillar of LCSA is questioned. Given that the discussion about economic indicators in LCSA takes place within the discussion about the content of LCC, it seems important to present the ongoing discussion in that sphere.

#### **1.3.1 Background: a short state-of-the-art on LCC in LCSA or the Economic-LCA (EcLCA)**

##### **Classical LCC**

The use of LCC dates back to the 60's, but the "first international standard addressing LCC was published in 2008 with ISO 15686-5" (Neugebauer 2016, 16). (Kloepffer 2008a) proposes to use LCC within LCSA for the economic pillar of sustainability, meaning that only microeconomic, real money flows are assessed, excluding external/externalities (in order to avoid double counting with LCA and SLCA) and other hidden costs borne by other stakeholders or macroeconomic costs. Two other approaches exist which consider external costs as well: Environmental LCC, which includes external costs that can be internalized, and Societal LCC, which includes all further external costs, i.e. "all costs carried by anyone in the society, whether today or on the long-term, through the inclusion of all external costs in a monetized form" (Neugebauer 2016, 17) based on (Hunkeler et al. 2008).

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<sup>43</sup> Lactalis/Walhorn dairy and MIK/Pur Natur dairy

<sup>44</sup> Laiterie des Ardennes and Arla Food/MUH located in Germany

While the definition of (Kloepffer 2008b) for LCC and the economic pillar of LCSA is widely used (including in the UNEP/SETAC Guidelines for S-LCA and LCSA (Benoît and Mazijn 2009; Valdivia et al. 2011)), some researchers, including some working on S-LCA, argue that the economic pillar of LCSA should be broader than the mere costs involved in product life cycles, or that assessing costs does not fit the conceptual approach of LCSA of sustainable development. While proposing an alternative content for the economic pillar of LCA (or EcLCA), those critics highlight also the potential overlaps between S-LCA and what should be the economic pillar of LCSA.

#### **Alternative approaches for the EcLCA**

(Jørgensen et al. 2013) argue that the use of LCC in LCSA does not fit with the definition of sustainable development from the Brundtland report, comprising two goals, namely alleviation of poverty and conservation of capitals. LCC should focus on the monetary gains or losses for the poor, but this topic is generally already addressed in SLCA. Another argument put forward is that LCC focuses on a group of stakeholder (producer or consumer) while SLCA focus is societal impacts (Jørgensen, et al. 2010; Wood and Hertwich 2013; Hall 2015; Steen and Palander 2016).

In an analysis of the modeling framework of LCC within LCSA, it is found that LCC “fails to capture the full dimension of economic sustainability” (Wood and Hertwich 2013, 1710). Thus, authors propose to add other indicators, that are based on LCC-derived data (value adding to the economy by type of input, import dependency, indicators associated with the role of capital and labour, the innovation potential, linkages and the structural impact on economic sectors).

According to (Neugebauer et al. 2016) the focus of LCC on the mere financial costs makes the tool not sufficient to assess the economic pillar in LCSA. They propose an economic life cycle assessment (EcLCA), introducing several impact categories, including profitability assessed by the product related value added<sup>45</sup>.

While those proposals widen the scope of considered economic issues, the inclusion of value added in LCSA does not allow to “capture issues of equity and distribution” (Hall 2015, 1631). In fact, there is no reference to a sustainability objective, such as a maximum or a minimum value for value added creation (or capture), and no reference to value added *distribution* between chain actors either. Referring to the proposal of (Wood and Hertwich 2013), (Hall 2015) argues that while it “avoid[s] double counting environmental and social impacts, the approach runs contrary to the call to situate economics within a moral framework to consider sustainability” (ibid).

#### **Assessing the distance to sustainability by monetarizing social impacts with preventative costs**

Outside of the scope of LCC or of the economic pillar of LCSA, several authors propose to complement the assessment of environmental and social impacts respectively through E-LCA and S-LCA: they propose a specific monetarization of impacts and the calculation of monetary costs to reach defined sustainability targets, such as the preservation of a resource or the compliance to certain standards. This monetarization of “impacts” use externalized preventative or abatement costs, i.e. costs that are necessary for negative impacts to be avoided, excluding thus costs of damage, restoration, compensation, which are judged more subjective and difficult to calculate (Croes and Vermeulen 2015). It implies the definition of thresholds that cannot be exceeded. Thus, while monetarization is considered

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<sup>45</sup> But also productivity, consumer satisfaction, business diversity and long-term investments.

as reflecting a weak sustainability approach that legitimates a substitution between capitals, this type of monetarization is close to a strong sustainability approach (Roman et al. 2016).

The main driving force behind the use of this approach is the assumption that prices do not capture all costs and that prices should be generally higher to reach sustainability objectives. The main objectives of those approaches are to calculate what would be those prices, as a communication tool that could be used for labelling initiatives (Hall 2019), but also “to provide the data for potential future internalization of product” (Croes and Vermeulen 2015, 178). One of the main advantages of those approaches are their prevention-based perspective, in opposition to damage-based perspective, as argued by (Croes and Vermeulen 2015):

*“Most current LCAs are damage- or impact-based, but sustainability impact is extremely complex to determine, it needs a longterm scope, and “large uncertainty is general to any model that relies on long-term forecasting” (Weidema et al., 2009, p.23); damage may occur at considerable spatial and time distance from the cause, and one cause may have an impact on several aspects. End-of-life assessment of long lifetime products with inherently uncertain future disposal technologies is especially difficult (Höjer et al., 2008, p.1964). Many of the required damage data are unknown (Reap et al., 2008, p.294). Social impacts are not easily quantifiable (Udo de Haes et al., 2004, p.4). The impact of health-related issues is usually characterized by the “disability-adjusted life years (DALY)”, the calculation of which uses subjective and time- and location dependent assumptions. DALYs not only lack objectivity and depend on time and location, but also change, e.g. because they depend on a people's development (Goedkoop et al., 2009, p.7).” (Croes and Vermeulen 2015, 179)*

Designed initially for environmental impacts with the Ecocost approach (Vogtländer et al. 2001), the research topic is currently growing with the consideration of social impacts: a case study on a T-shirt has been driven by the same research team (van der Velden and Vogtländer 2017)<sup>46</sup>, and two other distinct researchers proposed new methods, the Ecosocialcost approach (Croes and Vermeulen 2015) and the Sustainability Price (Hall 2019). The same kind of approach is also promoted by the True Price consortium, that just started a project with WUR on food products (WUR 2019).

The few applications of those approaches that exist (van der Velden and Vogtländer 2017; Hall 2019) calculate preventative costs for fair wages to be paid to workers along the life cycle of garment products, echoing with our price fairness indicator.

### **1.3.2 What we propose: price fairness as an economic indicator in S-LCA**

In the same vein as (Wood and Hertwich 2013) and (Neugebauer 2016), we propose to include alternative economic indicators in LCSA, but differently on two aspects. On one hand, we locate those rather economic indicators *in* S-LCA, so that relationships with ‘social’ indicators are effectively considered. On the other hand, our indicators “captur[e] issues of equity and distribution”, through the inclusion of thresholds, as made in Distance to sustainability approaches (Murray R. Hall 2015, 1631).

Thus, we propose to look at costs (as in LCC), and at the value or the price received (as in (Neugebauer 2016)) but in relation to each other, the objective being that prices effectively cover costs. Secondly, we look at profitability of value chain actors, but the objective is that it is positive rather than maximized. According to our framework, those elements are on one hand determined by power relationships

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<sup>46</sup> The study includes however monetary compensation costs in addition to prevention costs.

between chain actors and resulting value added distribution, and allow on the other hand employment and working conditions to be decent at the level of chain actors.

In the present case study, those indicators will be applied on one chain node only, i.e. on farms (cf. 2.). The price fairness indicator will therefore relate to the following questions: i) Is the price fair, i.e. does the price paid cover cost prices and decent incomes for farmer(s) and workers?; ii) How high should be the price for cost price to be covered and for decent incomes for farmer(s) and workers to be offered, i.e. for negative impacts stemming from underpayment to be prevented?

It thus implies the calculation of preventative costs and of actual cost prices.

### **Calculating preventative costs**

Thus, one part of the task is to calculate the costs that would ensure decent income conditions, that can be considered as preventative costs. With this case study, we test the calculation of preventative costs on a specific node (primary production), for a specific issue, which is fair income, as part of other Distance-to-sustainability approaches.

### **Calculating the cost price for a specific chain and with an alternative approach**

In addition to the challenge of calculating preventative costs, lies the challenge of calculating costs prices. While there exist some guidelines to calculate the cost price of agricultural products (especially milk) (e.g. works of the French livestock institute IDELE or method of EMB), those methods might not be adequate. In fact those methods are accounting-based, meaning that non-effective expenses and revenues are taken into account, such as stocks (e.g. of herd), capital depreciation and equity capital remuneration, thus some specificities of farms are not considered (e.g. level of self-financing and means of production ownership). An accounting-based approach is relevant for long-term strategies and for assessment and comparison of competitiveness between farms, regions and countries, while the other main approach based on treasury brings results that are supposed to be closer to the real situation of farms and to be more appropriate for day-to-day management of the farm and short-term decisions (IDELE 2013; Guillaume and Houben 2017). Because of this, we choose to use the treasury-based approach, which takes into account real expenses only, i.e. investment expenses made with own funds and reimbursement of loans instead of depreciation.

With this case study, we aim to test the feasibility and relevance of using the alternative treasury approach to calculate cost prices. More specifically, we use a specific dedicated tool developed recently by the Walloon agronomic research institute (CRAW): Trésogest is the produce of a research project led by the Walloon agronomic research center (CRA-W) and the tool has been built together with about 10 organic farms in 2016. It has been created to help farmers, especially of diversified farms, know about their effective financial situation. It provides an analysis of each farm activity and calculates cost prices for each activity (Guillaume and Houben 2017).

### **Placing chain governance and transaction modalities as drivers of other social sustainability aspects**

As in chapter 6, one of our methodological objectives is also to investigate whether chain governance and transaction modalities matter for the social sustainability of products, in the context of the low use of those aspects in existing S-LCA studies. By assessing the social sustainability of the drinking milk collected by the producer co-op, we want to draw learnings on the link between chain governance, transaction modalities and other social sustainability aspects, i.e. Do, and under which conditions, more balanced chains contribute to more balanced transaction modalities, more profitable farms and better working and employment conditions?

## 2. Materials and method

In this case study, we apply the methodological framework developed in Chapter 5, that we already applied in Chapter 6 in a larger extent. For feasibility reasons, the present case study focuses on specific issues and chain actors:

- We look at one product (drinking milk) and one alternative (the Biomilk chain) only, thus limiting the exercise to the comparison with the mainstream chain, whenever possible;
- We focus on the primary production node (farms), with no collection of specific data for other nodes of the chain.
- We focus on specific criteria and indicators, limiting the assessment to chain and VCA governance, transaction modalities profitability and employment conditions in farms.

### 2.1 Goal and scope

#### Assessed products, product system and system boundary

We assess in this case study the social sustainability of drinking milk produced by dairy farmer's members of the specific producer co-op Biomilk. The co-op trades the organic milk of its members (33 at that time), all located in Belgium, and seeks to provide a fair price to farmers. Farmers deliver most of their milk to the co-op, the potential rest being processed on farms (cf. Figure 27 and Figure 28). As the producer co-op does not own a processing facility, the milk is then sold to processors. At the time of the assessment, around 30 % is sold to small cheesemaking dairies, and 70 % is sold to a bigger dairy selling drinking milk and other dairy products under its own brand. Those products are then sold to wholesalers and to supermarket's central purchasing offices, and then to respectively organic shops and supermarkets, before landing in the hands of final consumers. We focus the assessment on a specific node of the chain which is the primary production, and we consider in the assessment the chain going through the big dairy and supermarkets, which is the main chain for the milk of the dairy co-op. We chose to focus on farms because it appeared in the case study of Chapter 6 as the most problematic node in terms of employment and working conditions, but also in terms of profitability and pricing mechanism used. On this latter aspect, farms were the only chain actor using market price to set their prices, rather than cost prices.

#### Assessed criteria and indicators

In terms of assessed criteria and indicators, we use the specific framework built in the context of the COSY Food project and presented in chapter 5. As this case study aims to test the applicability of specific indicators of the framework, some simplifications have been done, predominantly on the assessed criteria, which are not all included in this case study. We focus on two stakeholders (value chain actor and workers) and for workers, assessed C&I were limited by the access we had to data, thus profitability (through incomes) and working conditions (through excessive work hours) are assessed for farmers only, and work satisfaction was not assessed at all. In this study, we focus on farms and on the quantitative indicators which could not be assessed in the COSY-Food case study presented in chapter 6. The list of assessed criteria, indicators and reference points is detailed in Table 32 of Supplementary material 8.

For the price fairness criteria and for the calculation of the fair price or preventative social cost, we used a specific method, which we detail below.

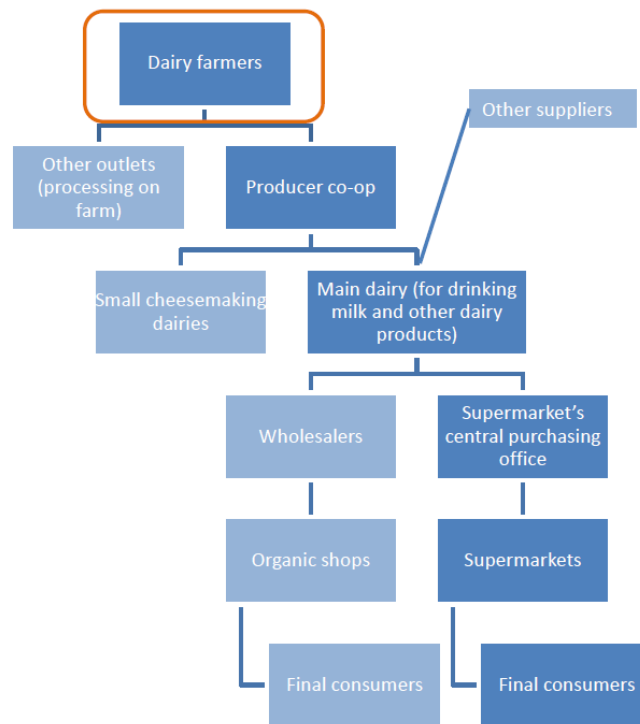


Figure 27: Considered chain in the assessment.  
The orange line indicates the system boundary of the study.

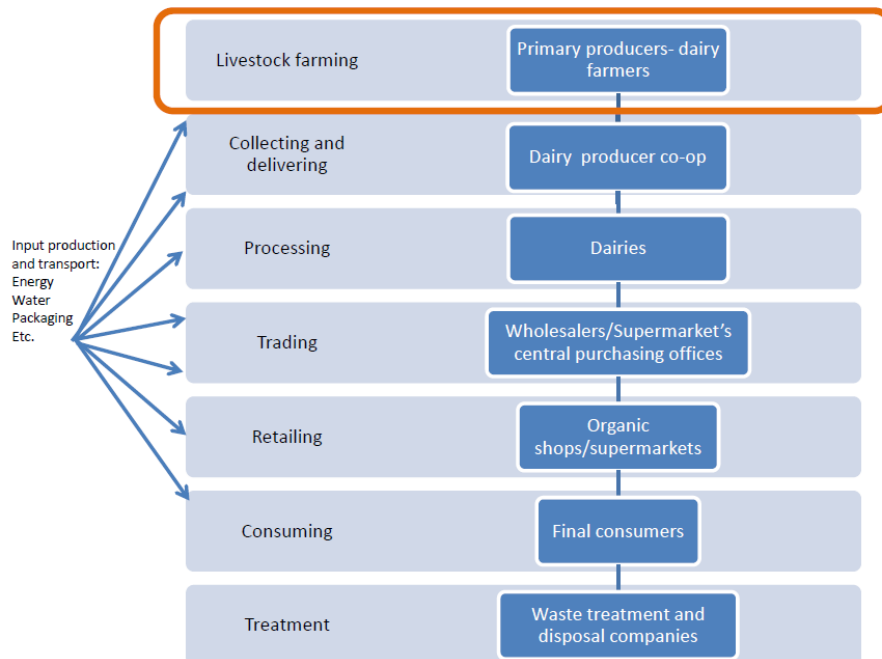


Figure 28: Product system and system boundary.  
The orange line indicates the system boundary of the study.



## Focus on specific indicators

### The price fairness and the calculation of a fair price including preventative social costs

The price fairness indicator is obtained through a 3-step approach (cf. Figure 29).

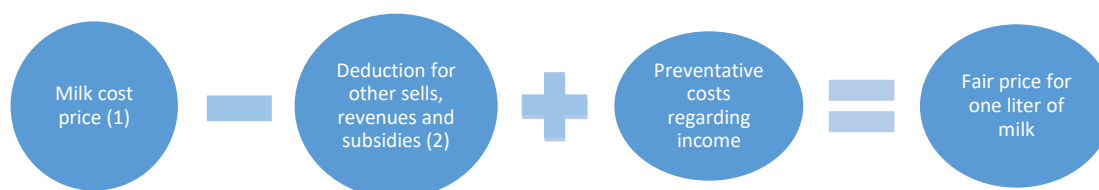


Figure 29: Basic calculation for the fair price of one liter of milk

Those 3 steps are the calculation for each farm and for one liter of milk of:

(1) The amount of the cost price for the milk. This amount is obtained by distributing the costs of the farm according to their use (e.g. milk production, other animal products or other field crops production that are not used as animal feed). Costs which are dedicated to several uses are distributed with the help of rules or coefficients set in the Trésogest tool. Those rules for the cost distribution coefficients have been defined together with farmers<sup>47</sup>. Basically, the « respective weight of each activity/product is calculated on the basis of the number of hectares allocated for each of them [...], of the number of yearly average livestock unit of each herd [...] and of a weighting coefficient defined by the French Institut de l'Élevage (Charroint et al, 2010) » (Guillaume and Houben 2017). Three kinds of costs are included at this stage: i) operational expenses (relating to crops and livestock) which rely strongly on production volume; ii) structural expenses relating to the whole farm and its functioning including rent, building, administrative, energy, water, material and labor expenses and iii) investment expenses for materials whose cost is higher than 500€. Those expenses can be funded through own funds or through loans. With an accounting approach, investments expenses would be calculated with the depreciation amount calculated by the accountant, making it the main item distinguishing both approaches. Incomes of farmer(s) are taken into account in the last step (3).

(2) The milk cost price is deducted from an amount corresponding to the milk share of the received subsidies (also with the help of Trésogest coefficients), to other revenues relating to the milk activity (such as the selling of cattle (net from purchase)) and to the milk share of other selling such as material and manure) and other revenues (such as energy production, rental activities)

(3) Finally, preventative costs, for farmer, family and farm workers to be paid fairly are included.

- To include the income for the farmer and family labor, we use the method and figures of the BAL/EMB study of cost prices of Belgian (conventional) milk for 2016 (BAL/EMB 2017, 6). The method defines amounts that should be paid for each working hour, for the farmer (skilled worker, 19.97€/hour) and for family labor (specialized worker, 19.10€/hour). Each amount is then multiplied by the number of hours worked on the farm. In an average Belgian dairy farm with a 1.75 FTE, the farmer works 2618 hours per year as a FTE (which makes 52,281€/year) and the family labor works as a part-time equivalent (0.75 FTE), i.e. 1963 hours per year (37,493€/year). We used the same general idea and figures and adapted the number of worked hours depending on the number FTE on the farm. Those amounts can be considered as opportunity costs corresponding to the amount

<sup>47</sup> Adapté de Mary Guillaume et Patrick Houben, CRA-W, 2017. « Tresogest : un outil de gestion financière qui s'inscrit dans une démarche collective et participative », Itinéraires bio n°37, p. 42

that a farmer would pay for a salaried worker to do his job if the sectoral minimum hourly wage is respected.

- In addition, for each hour worked under a contract not providing full social benefits (i.e., cf. related indicator of low-cost worked hours), we add a specific amount corresponding to an estimate of the additional cost that a contract providing full benefit (such as an employee contract) would imply for the farm. For this, we use also the amount defined by the BAL/EMB study and for specialized workers.

Those two costs can be considered as costs to prevent specific negative social impacts to occur, i.e. preventative costs relating to unfair income, including social benefits (cf. 1.3.2). It has to be noted that existing studies calculating preventative costs for fair wages to be paid use likely lower parameters regarding income level: the study of (van der Velden and Vogtländer 2017) uses as a threshold the payment of a wage equivalent to 50 % of the average minimum wage of Western European countries, and the study of (Murray R. Hall 2019) uses as a threshold living wages. We chose to refer to industry norms, taking into account the especially high number of working hours in dairy farm, in comparison with other sectors and industries.

### **Profitability**

According to our framework, the profitability of farms is assessed by looking at the level of income of the farm as calculated through Tresogest. This level of income is calculated per FTE.

## ***2.2 Inventory***

### **Data collection and sample**

We collected specific data from five farms supplying the co-op, among the 33 co-op members at the time of data collection. We focused on 5 farms in order to have a sample representing the diversity of farms that are members of the producer co-op, while being manageable in terms of data collection. The 5 farms were selected by the co-op director on the basis of their differences in terms of size and location, which involves a risk of bias. However, passing through the director was necessary to have access to farms. Those farms cover five Belgian provinces, two are located in Wallonia and three in Flanders. Selected farms are 21 to 116 hectares big and have a herd from 39 to 184 dairy cows. Three of those farms have only dairy cows, while two of them grow field crops as well and one of them processes a part of its milk on the farm.

We collected mainly accounting data and we sent a questionnaire about employment conditions to the farm managers. In addition, we interviewed the co-op director. Data were collected for the year 2016.

## ***2.3 LCIA and interpretation of results***

For this case study, we carried out a type I or reference scale/referencing LCIA only, given the fact that it was not possible to make a comparative study within life cycle phases and chains (as we did in the COSY-Food case study, cf. chapter 6). As far as it was possible, results of the alternative chain are compared to the mainstream chain for the same product (organic drinking milk).

For all indicators, a referencing was made on the model of subcategory assessment method (SAM) (Ramirez et al. 2014), with A to D scores, and the specification of a basic requirement to be fulfilled (corresponding to the B-level) (as described in the previous chapter, cf. 2.3.1 of chapter 6).

### 3. Results





#### 3.1 LCIA results or what are the social sustainability performances of the Biomilk milk?

The results are composed of three main themes: chain and VCA governance, transaction modalities, and profitability and employment conditions.

##### 3.1.1 Chain and VCA governance

The Biomilk chain is composed of three intermediaries between primary producers and final consumers: the producer co-op (which takes care of the collection), the processor (dairy) and the retailer (the central purchasing office of the supermarket being considered as a department of the retailer) (cf. Table 27). This is more than the mainstream chain for organic drinking milk which includes only two intermediaries: the dairy (which takes care generally of the collection and of the processing<sup>48</sup>) and the retailer. For this theme (Chain and VCA governance), the whole chain from primary production to retail is looked at so that a broad overview is provided, while for the other themes, we only look at the primary production node and at its relation with the next node (co-op or processor).

Table 27. Results regarding chain and VCA governance

Criteria	Farm 	Co-op 	Processor 	Retailer 	Chain
Chain length	D				Alternative chain
Level of control of the organization	SP farm	Prod co-op	Plc dairy	Plc retailer	
Participation by other VCA	Nap	A	C	C	
Competition management	Nap	A	C	C	
Market power	A	C	D	D	
Chain length	C				Mainstream chain
Level of control of the organization	SP farm	Plc dairy		Plc retailer	
Participation by other VCA	Nap	C		C	
Competition management	Nap	C		C	
Market power	A	D		D	

The Biomilk chain is longer, but there is a **higher level of democratization**, since the collector, the producer co-op, is owned by its suppliers only, contrary to the private dairy of the mainstream chain which is not owned by its users<sup>49</sup>. In this sense, there is a higher participation of farmers in decision making relating to the marketing of their produce, which ensures a higher level of control in the Biomilk chain. However, in the downstream part of the chain, the level of democratization is low, since drinking milk is processed by a private dairy and sold mainly through one of the three big Belgian retailers which are public limited companies (Plc) quoted on the stock exchange, as in the mainstream chain.

The presence of the dairy co-op ensures a certain **control of competition** since it is meant to sell and buy the milk of its members only, contrary to a private dairy which is not structurally bound to certain suppliers. Again, in the downstream part of the Biomilk chain, there is no competition management, with the processors and the retailer having no obligation regarding sourcing, as it is the case in the mainstream chain.

<sup>48</sup> Often through various legal entities however, with the subsidiarization phenomenon (Filippi 2016).

<sup>49</sup> According to the most recent available figures (Verbeke 2014), the main Belgian collector of organic milk is a private dairy (Lactalis/Walhorn), however, other main collectors are producer co-ops (LDA-Coop, Mik, Arla). This is different from the conventional mainstream chain, which functions with cooperative dairies mainly. This is the reason why we also refer to classical cooperative dairies in the assessment as well.

Finally, all actors, with the exception of farmers, have a **high market power**: in the Biomilk chain, the producer co-op is one of the five collectors of organic milk operating in Belgium<sup>50</sup>, the private dairy is one of the four processors producing drinking milk<sup>51</sup> and three retailers dominate 65.4% of the market in 2014 (Observatoire des prix 2014). In the mainstream chain, farmers face alone an even higher market power, since they sell their milk to the main organic dairy collector which is also one of the four processors (Verbeke 2014; BioForum Vlaanderen 2018).

Thus, in terms of chain governance, Biomilk chain seems more balanced and democratized than the assessed mainstream chain, and this is mainly linked to the cooperative status of the milk collector. The cooperative can be seen as a tool precisely to rebalance power relationships between farmers and further value chain actors. However, we know that farmers do not always benefit from transactions with co-ops, with unbalanced power relationship between farmers and their co-ops being described, given the current size of main co-ops resulting from the various merges and acquisitions that occurred in the last decades (see also chapter 6) (La Spina 2016; VRT 2018; EMB 2012). In that context, is Biomilk different from other classical dairy co-ops? If so, how?

### 3.1.2 Transaction modalities






We argue that main differences lie in the targeted markets and in the transaction modalities made possible. This subsection looks specifically at trading relationships between farmers and processors, in the alternative Biomilk chain and in the organic mainstream chain, while also keeping an eye at the conventional mainstream chain, which functions mainly with cooperative dairies (cf. Table 28).

#### Commitment between value chain actors

Through the co-op membership, farmers have a guarantee over their outlet, since the co-op is committed to buy all the milk of its members. In the organic mainstream chain, it is uncertain that farmers supplying the private dairy have a secured outlet<sup>52</sup> since contracts are not compulsory in Belgium (CBL 2016), contrary to e.g. in France since the end of dairy quotas (Lambaré et al. 2018). In the conventional mainstream chain Belgian dairy farmers have secured outlets, as provided by Biomilk.

**Downstream the Biomilk chain**, a one-year contract governs the relation between Biomilk and a private dairy (which is the main buyer of the co-op milk) with fixed quantities and fixed prices over the year<sup>53</sup>.

Table 28. Results on transaction modalities

Criteria/Indicator	Farm 	Co-op 	Processor 	Retailer 	Final consumer 
Commitment between VCA	A	B			Alternative chain
Who sets the price?	D	C			
On which basis?	B	C			
Commitment between VCA	Nav				Mainstream chain
Who sets the price?	D				
On which basis?	C				

<sup>50</sup> Arla/Laiterie Coopérative Euregio Arla, Biomilk, Laiterie des Ardennes, Mik/Pur Natur, Lactalis/Socabel/Walhorn

<sup>51</sup> Arla/Laiterie Coopérative Euregio Arla, Laiterie des Ardennes, Mik/Pur Natur, Lactalis/Socabel/Walhorn

<sup>52</sup> We could not find information on the transaction modalities between the dairy and its suppliers.

<sup>53</sup> As generally in the dairy sector, the price evolves during the year, with higher prices in fall to incite farmers to produce more when the production generally falls, and lower prices in spring to incite farmers to produce less when production increases. In the case of this transaction, it means that a price per season is fixed.

## Pricing mechanism

The price negotiated by the co-op with the dairy is then imposed to farmers, as in mainstream chains. However, main differences lie in the fact that this price is fixed over a year, known in advance and it is likely to be higher than in mainstream chains.

### *A fixed price known in advance*

Biomilk offers **a fixed price** per liter of protein and fat (with seasonal variations) to its farmers **which is known before the milk is collected** (when the contract is agreed with the dairy). This is the main difference with farmers delivering milk to classical dairy co-ops who know the price they will receive after the milk collection (when they are paid by the dairy, at the end of each month generally) and who receive a price that increases or decreases according to market price variations. How can Biomilk achieve that? As described by (Bijman, J. et al., 2012, cited by (Mondelaers et al. 2014, 3), classical cooperative dairies “collect all produced milk of a member, in return for the farmer’s loyalty, resulting in temporarily surpluses which then need to be diverted to less profitable markets (such as milk powder for the global market)”, whose price are also more volatile. On the other hand, private dairies function differently and “use contracts or other means to avoid surpluses and can better plan their milk supply”, resulting in generally higher prices when comparing with prices offered by cooperative dairies. However, those are not fixed either and are generally known a posteriori by farmers (BASIC 2019). Biomilk has to collect all the milk of its suppliers (as a dairy co-op) but targets Belgian processors only (such as the dairy, but also smaller cheesemaking factories), for products to be sold on the local market mainly, through long-term trading relationships. By targeting those markets and not remote and bulk market implying high volatility, Biomilk is able to guarantee a certain price to its members<sup>54</sup>. Thus, for both chains, the price is imposed to farmers, but farmers supplying Biomilk face less uncertainty and price volatility and are thus more likely to be equipped to plan incomes and expenses.

However, in addition to stability, Biomilk has also the objective of providing a fair price that covers costs to its members. Is it the case? To address this question, it seems important to look first at how prices are negotiated between Biomilk and its main buyer.

### *The basis used for price setting*

The guaranteed price is negotiated each year by the co-op with the dairy processor. As explained by the co-op president, as a support to negotiations, a calculation of cost prices at farm level was made for the period 2013-2014: it resulted in cost prices of 48,2 (2013) and 49,9 €/100 liters of milk (2014)<sup>55</sup>, on a sample of respectively 8 and 10 organic Flemish farms. However, in 2016, the standard price received by farmers amounts 48€/100 liters on average along the year (from 45 to 51 €/100 liters according to seasons, and this price was 44.59€/100 liters in 2015 (Devreese 2016).

Given the fact that a price is guaranteed over a year and that cost price calculations are used in negotiations, it seems that the price is not completely based on pure market price and that a combination of different means inform the negotiations. Yet, these prices seem to be closer to market prices than to calculated cost prices: between 2015 and 2018, prices received by farmers stand between

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<sup>54</sup> At the same time, since it does not have any processing facility, Biomilk cannot process milk surplus, and has to sell it as conventional milk when necessary.

<sup>55</sup> A liter containing 3,4% of proteins and 4,2% of fats, that is 7,6% together, as in the rest of this chapter, when not specified.

44,79 and 48,97€/100 liter in France and between €47,56 and €48,96 in Germany<sup>56</sup>. More than higher or fair prices, the specificity of Biomilk seems to be the provision of yearly guaranteed and stable prices.

In this context, we may ask whether prices paid to Biomilk farmers are fair or not, i.e. do they allow to cover cost prices of farms and decent incomes for workers?

### Price fairness

We calculated price fairness for 5 farms of the Biomilk co-op (cf. Table 29). According to our calculations, the price offered to farms is not fair for 4 of them, with coverage rates of the cost price by the paid price between 57% and 110%. When doing the average of the three middle range farms, the coverage rate amounts to 75 %.

It has to be noted that even if the accounting approach is used (rather than treasury) (cf. 1.3.2), the results would be similar, with an overall higher coverage though, from 65% to 117%. It has also to be reminded that a fair price requires all costs relating to milk production to be covered (operational, structural, investment costs), but also that work hours are paid between 19.10 and 19.97€/hour gross. Those results mean that despite the efforts undertaken to provide a fair price to farmers, it seems that there is still progress to be done in that direction according to our calculations.

*Table 29. Results on fairness of price*

Criteria/Indicators	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Average of the 3 middle-range farms
Coverage of costs (incl. incomes) by the price paid	72%	70%	57%	84%	110%	75%

### 3.1.3 Profitability, employment conditions and other broader societal issues

Regarding performances of each farms in terms of profitability, employment and working conditions (cf. Table 30), it has to be noted that most farms clear more than 90 % of their total agricultural production through Biomilk, and one farm clears 78 % through Biomilk. This means that the results below on profitability, employment and working conditions concerning the whole farm can be linked to the transaction through Biomilk<sup>57</sup>.

According to the calculations made with the Tresogest tool, three farms out of five are not profitable, with a negative disposable income per FTE, and one farm generates around 15000 € per FTE. When comparing with regional statistics, those farms do not seem to perform better than average Belgian farms (cf. 1.1).

<sup>56</sup> Own calculations for a liter containing 7,6% of fat and proteins on the basis of figures from (FranceAgrimer n.d.; Bioland e.V. n.d.) (Belgium, France and Germany use different amount of proteins and fat per liter to express prices). Belgium, statistics on prices are quite rare and the only figures that we found for Belgium seem to use Biomilk prices only (Timmermans and Van Bellegem 2018). It has to be noted that in France, market organic prices are influenced by prices offered by Biolait (which collects 30 % of French organic milk) and which could be higher than prices paid in organic mainstream chains. However, as in the case of Biomilk, Biolait prices are not necessarily higher than prices offered by other actors (cf. Conclusions).

<sup>57</sup> That does not mean that profitability of farms is necessarily the results of fair or unfair transaction modalities in the Biomilk chain (it can be the results of other factors, such as unanticipated higher costs, decrease in production, or mismanagement), but an improvement in the transaction modalities in the Biomilk chain is likely to have an important impact on the farm given the share it represents in overall sales.

Table 30. Profitability, employment and employment conditions on farms

Chain actor	Criteria	Indicators	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5
Value chain actors	Profitability	Market share	99,8%	92%	78%	100%	100%
		Disposable income per FTE (Tresogest) (before taxes)	15.631	-10.783	-12.612	-24.264	63.017
		Use of other gainful activity	B	B	C	B	B
Workers	Social benefits/security	Provision of contracts with full benefits	C	Nav	A	A	C
		Use of 'low cost' worked hours	B	Nav	C	C	C
		Use of unstable work contracts	Nap	Nav	C	D	Nap
	Working time	Excessive work hours	B	C	D	D	C
Broader societal issues	Provision of jobs	Number of worked hours/FU	1,70	1,14	1,67	0,48	0,96

The other indicator for assessing profitability is the use of other gainful activity: only one farm makes use of another gainful activity (farm retail store) out of the five assessed farms, this farm being the least profitable of the five.

Two out of the four farms for which information was available provide at least one job with an employee contract. On the other side, three out of the four farms use so-called low-cost hours (e.g subsidized and daily contracts, disguised employment/'false' self-employed person, non-paid familial labour, or non-declared). On the two farms providing jobs, both use unstable work contracts or arrangements, including daily contracts for one of them. Finally, in four of the five farms, the farmer works more than 60 hours a week, including two around 70 hours.

The number of work hours per functional unit informs on the labor intensity of processes and on the potential for each farm to provide jobs. This number ranges from 0,48 to 1,70 worked hours for 100 liters of produced milk. No data were found to compare those results with other farms.

### 3.2 What would be a fair price or a price that cover cost price and would prevent unfair income?

We conclude this assessment by proposing what would be a fair price to be paid to each of the assessed farms, and to all Biomilk farms on the basis of the sample of 5 farms. The Table 31 below shows those results for the five farms and the breakdown of cost items and other parameters that supported the fair price calculations (cf. Materials and method for more detail on the calculation method).

For results to be adapted to a maximum number of farms, this exercise should have been made on a larger scale. As for the coverage indicator, we can observe big gaps between farms, with differences between the highest and the lowest results reaching almost 40 euros/100 liters. This is why we decided for the average calculation of the common price for Biomilk to remove those two farms, and to use only the results of the middle-range farms.

If all worked hours by farmers and workers would be paid fairly, the price should be 64,36€/100 liters, i.e. between 15 and 30% higher than the price actually paid (when excluding farms with the lowest and highest results).

Table 31: Fair price results and breakdown per items

	Breakdown of prices	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Average of the 3 middle-range farms
<b>1</b>	<b>COSTS</b>						
1.1	Operational expenses	16,03	24,23	31,96	25,30	14,59	<b>21,85</b>
1.2	Structural expenses	16,14	23,16	26,11	19,54	14,02	<b>19,61</b>
1.3	Investment costs	22,53	16,43	31,53	16,38	13,27	<b>18,45</b>
	<b>Cost price, excl. family labour income</b>	<b>54,69</b>	<b>63,81</b>	<b>89,60</b>	<b>61,22</b>	<b>41,87</b>	<b>59,91</b>
<b>2</b>	<b>OTHER INCOMES TO BE DEDUCTED</b>						
2.1	Subsidies	8,98	10,10	19,72	7,81	10,10	<b>8,96</b>
2.2	Other takings to be deducted	4,60	6,14	10,95	2,91	6,21	<b>4,55</b>
	<b>Cost price, excl. family labour income and deducted from other takings</b>	<b>41,12</b>	<b>47,56</b>	<b>58,94</b>	<b>50,50</b>	<b>25,56</b>	<b>46,39</b>
<b>3</b>	<b>FAMILY LABOUR INCOMES AND OTHER LABOUR COSTS/PREVENTATIVE COSTS</b>						
3.1	Preventative costs for farm workers to be paid fairly with full social benefits (to make low-cost hours regular hours)	0,00	0,00	1,00	0,12	0,00	0,04
3.2	Preventative costs for income of farmer and family labor to be fair	19,22	20,56	34,74	8,81	-4,25	19,22
3.3	Actual income for farmer(s)	8,29	-0,10	-10,77	-3,02	22,84	8,29
	<b>FAIR PRICE</b>	<b>68,62</b>	<b>68,03</b>	<b>83,90</b>	<b>56,41</b>	<b>44,16</b>	<b>64,36</b>

Note: All costs are expressed per 100 liter of energy-corrected milk (ECM) containing 7,6 % of proteins and fat (4,2 g fat and 3,4 g of proteins per liter), excluding VAT.

When looking at preventative costs in particular, we can see that costs per liter of milk to prevent unfair income for workers are rather low (showing the low number of involved hours), but costs to prevent unfair income for farmer and family member is important, since it ranges from 8,81 to 20,56/100 liters of milk for the 3 middle-range farms. A comparison of our results on fair price with other existing calculations is to be found in Supplementary material 9. This comparison highlights that our results on cost price should be taken with caution, with big differences existing between studies: in particular, our results are far from the results of the calculation made in 2014 before on 10 Biomilk farms (49,9€/100 liters) (Bijttebier and Govaerts 2016), but are close to a recent study commissioned by the EMB on 227 German organic dairy farms (which finds a cost price including income ranging between 58.53-67.50€/100 liters on the 2013-2019 period).

The analysis comparing costs prices with actual received price could be done similarly with other chain actors (processors, retailers), and conclusions could then be drawn on value added distribution in the chain. On the basis of our results, we can already draw conclusion on the value that is captured by the chain node of primary production, which seem too low for cost prices and decent income for workers to be covered.



## 4. Discussion and conclusions

In this section, we propose to discuss our results in the frame of our two main objectives, empirical (4.1) and methodological (4.2).

### *4.1 Verifying AFNs sustainability claims and discussing hotspots and improvement levers*

#### **4.1.1 How do the Biomilk chain compare to mainstream chains?**

On the basis of our assessment, we can conclude the following: the Biomilk chain, in particular the node linking farmers and the producer co-op, is different from the mainstream organic chain because of the high level of control by farmers on the collection phase (and subsequent sales to processors), thanks to the co-op status. In addition, Biomilk provides more balanced trading relationships than what is offered by classical dairy co-ops: in addition to the guarantee over their outlet, dairy farmers benefit from a guaranteed price over a year, which is known before the milk is collected. This main difference with classical chains potentially gives farmers the possibility to better plan revenues and expenses, but also a feeling of control, when other dairy farmers just put up with the price they receive. The strategy of targeting local markets and to use contracts to sell most of their milk to processors are potential factors that make Biomilk able to provide such a guarantee over prices.

However, it seems that the price paid by Biomilk is equivalent to yearly market prices. In this context, we may ask whether this price is fair or not for farmers. According to our calculations, we find that this price does not cover cost prices (including family income) for 4 out of the 5 assessed farms and three farms out of the five (whose main outlet is Biomilk) receive a negative disposable income per FTE. Also, employment conditions are not fair for all workers and working time is excessive in most farms. Finally, our calculations on this small sample show that the price should have been 15 to 30% higher than the price paid at that time, for unfair income for farmers and workers to be prevented. While our results differ from a previous calculation made previously on Biomilk farms, it is in line with a calculation made on German organic farms on a much larger sample.

#### **4.1.2 Understanding those results**

##### **A lack of participation of further value chain actors in the initiative**

A first set of explanation for this surprising gap between Biomilk first objectives and those assessed social sustainability performances regards the chain in which Biomilk evolves: the main client of Biomilk do not position in the Fair trade niche, and actually do not send its produces as such, or as products derived from Biomilk milk either<sup>58</sup>. Biomilk seeks to develop an organic fair trade supply chain on the Belgian market, but it seeks to do that without the participation of downstream value chain actors. For their sustainability promise to be realized, there is a need for further value chain actors to engage in the initiative, for the co-op to be able to pay to its farmers at least the price that the only calculation at that time found as cost price (Bijttebier and Govaerts 2016).

##### **Recent prospect: the partnership between Biomilk and Delhaize**

Since 2018, Biomilk has found a partner willing to collaborate on the long term: their milk is now mainly sold through a new partnership with one of the three major Belgian retailer (Delhaize), which “proposes a selection of organic dairy products made from Belgian milk produced by Biomilk dairy farmers” in its Belgian and Luxemburg shops (Delhaize 2018). This partnership offers a commitment on a guaranteed

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<sup>58</sup> The main client of Biomilk might also source its milk from other suppliers at that time.

volume per year, and Delhaize states that it sees it as a long-term partnership. Regarding prices, no clear communication is made on the issue, but a press article reports a price of 48,5€/100 liters to be paid to farmers (RTBF 2018), i.e. almost the same price as the one paid by the co-op in 2016 and a price equivalent to market prices. The major progress of this partnership seems to be on the commitment side, which is said to be long term, and on the price guarantee and stability, the price level remaining apparently the crux of trading relationships.

#### **A similar situation on the French organic milk market?**

The alter ego of Biomilk in France, Biolait, does not seem to provide to its farmers higher prices than market prices either. This is despite the fact that Biolait sells around 20 % of its milk through two chains which can be considered as fair trade chains according to a study on the subject (BASIC 2019), given the tripartite contractualization with a processor and two retailers (Biocoop and System U), and of the cost calculations that have been used to set prices at the level Biolait and its farmers.

Their objective as stated in the Biolait website does not refer to fair price or to “price covering cost price”, but rather to a stable and unique price for every farmer (Biolait n.d.). According to press reports, prices paid by Biolait would not be always higher than prices paid by their competitors, and even lower in 2019<sup>59</sup> (Paysan Breton 2020). As examples, between 2017 and 2019, the price received by Biolait farmers ranges between 43 and 47,06€/100 liters<sup>60</sup> (Biolait 2020; BASIC 2019). The Biolait pricing strategy is quite particular, since the selling price to processors is set and is the same for every buyer, and if no one wants to buy the milk at that price, “the milk is downgraded as conventional milk, rather than sold off as organic milk”, in order to avoid the start of a downward spiral for organic prices (BASIC 2019, 25). Thus, the price paid to farmers depends on the volume of milk that was downgraded, or on the willingness of processors to pay the Biolait price.

However, the sustainability of a product or a chain is not just about price. Beyond the price objective (stable and unique), the objectives of Biolait are to collect organic milk everywhere in France, it thus contributes to the development and support of organic farming: starting from 6 farmers in 1994, Biolait collects the milk of 1300 farms, i.e. 30% of French organic milk. As detailed in the BASIC study, the two fair trade chains with Biocoop and System U generate a number of positive impacts, on various aspects (trust, security, visibility, autonomy, sense of belonging, solidarity, dignity) and at different levels (farmers, other value chain actors of the two chains, but also of other chains through knock-on effects). Yet, the study eludes the crucial impact of farm profitability and sufficient livelihood for farmers.

#### **Put simply, are organic prices sufficient for farms to make it through?**

Our results and findings highlight that prices paid within the organic fair trade chains starting from Biolait and Biomilk are globally the same as in organic classical chains. In this context, the question can be asked in different terms: are prices paid to organic farmers fair or sufficient? According to a study comparing the profitability of French dairy farms in 2013 on a large sample<sup>61</sup>, the average gross operating profit by annual working unit (i.e. a proxy of income per FTE farmer) of organic dairy farms is only 6% higher than

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<sup>59</sup> This can be explained by the fact that it collects milk everywhere (and even where collection costs are high, contrary to other collectors). Also it is argued that other dairies have to pay higher prices than Biomilk to attract farmers (Paysan Breton 2020).

<sup>60</sup> Those prices cannot however be directly compared to other cited prices since they do not take into account the energy-content of the milk.

<sup>61</sup> 1 790 organic farms (over a reference population of 6 200 farms), compared to 27 787 conventional farms (over 206 490 farms). The study does not consider farms with takings lower than 76500€.

the one of conventional dairy farms (Dedieu et al. 2017). The same study evaluates that organic winegrowers would earn 34% more than conventional ones, but that organic market gardeners would on the opposite earn half of what conventional ones earn<sup>62</sup>. Organic farming clearly does not mean higher incomes, and given the concerning profitability issue for conventional dairy farms (cf. introduction), it is unlikely that this 6% difference is enough to make a real difference for organic dairy farmers. On the basis of those income figures, prices paid to organic farmers do not seem to be sufficient, and so do prices of the French (and Belgian) organic fair trade chains.

Looking at results more closely, it appears that the gross operating profit is effectively higher for organic dairy farms (+ 20%), since higher prices (+18%), higher subsidies, and lower costs (-20%) compensate lower productivity per dairy cow (-20-25%) (cf. Figure 30). But when related to or divided by the number of annual work units (AWU) or non-salaried farm FTE, the advantage amounts only 6%. Thus, while it is commonly believed that organic farming pays much more than conventional farming, one forgets that productivity is much lower and labor requirements higher.

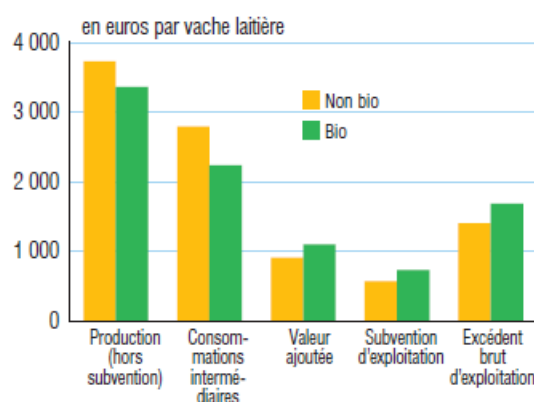


Figure 30: Economic indicators of French dairy farms, 2013 (Dedieu et al. 2017)

Note: in €/dairy cow. Green: organic; yellow: conventional; 1. Takings; 2. Intermediary consumptions; 3. Added value; 4. Subsidies; 5. Gross operating profit.

### Why is it so difficult to impose more income-generating prices?

In turn, some fair trade chains for conventional milk make it to offer a premium (i.e. an increased price) to farmers: farmers producing the milk 'C'est qui le patron' get paid 38€/100 liters (thus a price premium of 9€ in 2018), or FairFrance producers get 44€/100 liters (La Libre 2018; FaireFrance n.d.). Against this background, we may ask why it is so difficult to do so for organic milk?

One reason might come from the big size of Biomilk (and Biolait) within the organic dairy market: as emphasised by Le Velly (2004, p. 250), 'the larger the size of the participation in the market, the less the exchanges realised can be disconnected from the habitual practices of the market'" (Feyereisen, Stassart, and Mélard 2017, 311).

Another reason could be more psychologic: organic milk is already more expensive than conventional milk, and buyers (including final consumers) might not be ready to pay an additional premium linked to fairness or social aspects. However, with this reasoning, workers continue to pay the price, the respect of environmental principles being made at the expense of the improvement of income and employment conditions in farms.

<sup>62</sup> The study warns about those results: this gap for market gardeners is especially true for big farms and reduces substantially for small farms (Dedieu et al. 2017).

### 4.1.3 What could be done? Improvement levers for the social sustainability of organic dairy chains

#### More transparency on costs and on prices, at the level of farms

In order for dairy farmers to get a fair price, there is a need for cost price calculations for the various farming types (conventional, organic), for various geographical areas, on large samples and regularly, so that prices can be tailored to farming types and geographical areas as far as possible, and adapted according to costs evolutions over time. Those calculations should be made public or at the disposal of farmers at least to support their negotiations with buyers.

However, there is a need for the method and the methodological choices behind calculations to be transparent, the ideal being for those calculations to be made through a harmonized method. For now various methods co-exist. The main choices to be made include the approach (treasury-based/based on actual expenses or accounting-based which includes many fictive costs), the coefficients for the distribution of costs to the various farm activities, and the level of income that a farmer should earn, on the basis of a monthly income, or of a hourly income (in that case, the number of worked hours that should be taken into account should be defined). Since the method used may have a direct impact for farmers, it should be primarily discussed and agreed with farmers and dairy co-ops.

Also, there is a need for transparency of prices at the different nodes of value chains. In Belgium, prices paid to producers are particularly abstruse, contrary to neighboring countries such as the Netherlands or Germany.

#### And at all other levels of chains

The present analysis on price fairness has been done on farms only, but could have been done for other chain nodes as well: processors, wholesalers and retailers. The likeliness of the willingness of those actors to participate in such assessment is small, as our attempt to include further value chain actors shows. Yet, we could have identified whether the cumulated created value is disproportionally captured by one or more chain actor(s), at the expense of others (presumably farms), and also where there seems to be a disconnection between captured value by one chain actor and internal distribution of value to workers, through poor employment and working conditions.

Given the upward trends observed in terms of capture of gross profit by retailers and processors for drinking milk (cf. 1.1 and (OFPM 2019) for French figures), it seems that some of the added value could be taken there, for the benefit of farms<sup>63</sup>. At the level of processors, gross margins for drinking milk increased impressively by 10 points in ten years (OFPM 2019). At the level of retailers, it seems that margins are quite high (in comparison to other products sold), given the role of drinking milk as a “cash cow” (Mevel 2013). For organic products, even more disproportionate margins seem to be taken by retailers (Girard 2017).

At the same time, for retailers, the analysis should be made at an organizational level, given the multiplicity of products sold. Also, this should be complemented with an analysis of employment and working conditions at the level of each chain actor. For retailers, there are indications that the captured value is already internally not sufficiently deployed to workers, given the modest employment and working conditions prevailing in supermarkets (cf. 3.3 of chapter 6). Thus, a redistribution of added

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<sup>63</sup> It has to be reminded that gross profit corresponds to the difference between sale price and cost of raw materials/inputs, it does not take into account all costs, this is why we argue for the use of a more comprehensive indicator.

value between chain actors in favor of farmers should only take place at the condition that sufficient value is deployed for internal workers.

Also the question should be raised at the level of final consumers: would it be advisable and reasonable to pass part of a price increase stemming from inadequate price for farms on them? While it is not reasonable to argue for an unilateral e.g. 10 % increase in drinking milk price (and other potentially concerned food products) that would affect all households whatever their income level, we would argue for a rebalancing of expenses within household budgets in favor of basic goods, and also a rebalancing of prices so that they correspond to actual costs incurred by the seller, in one direction or the other: while the household budget dedicated to food decreased steadily since the 60's (from 36 % to 15% in 2009 in Belgium), the budget dedicated to housing increased (from 7 to more than 18 % in 2009 in France)<sup>64</sup> (Winandy and Comps 2012; Fabre 2011). This is despite the fact that a big part of the costs required for providing a housing are likely to have been already amortized for a large part of the housing stock. This proposal may seem quite unrealistic, but it could be considered as an opening to think economics differently or as a target to be reached: a rebalancing of prices so that those reflect actual costs incurred by sellers, and so that those working for providing those goods and services are paid decently.

#### **Raising awareness of final consumers for them to accept a matching between actual costs and prices**

Before such a systemic process starts, for consumers that are able to pay higher prices for their food, there is a need to make them aware of what is behind low prices of food. There is a need for transparency, to make them aware of how food chains (and others) function, and at the potential impacts that those might have on various value chain actors, but especially those located at the upstream side of chains. The application of S-LCA or other assessment tools at a broad scale could be useful in this regard.

Also, there seems to be a disconnection in consumer minds between prices and what they imply in terms of respect of labor and the environment. For this particular aspect, the distance to sustainability approach tested in this case study, i.e. the calculation of the gap between the price paid and the fair or true price, seems to have a certain potential to communicate impacts to consumers in a simple way. However, it is unlikely that it is used at a broad scale and for all chain actors given the sensitivity of required data, and the time-consuming aspect of the method. Finally, such a labelling should be made compulsory to be really useful, but it is unlikely that such a proposition would get enough support at various levels.

#### **Rebalancing power in dairy value chains, through producer organization, competition policy and a supportive Common agricultural policy**

The transparency of costs and prices can be useful only if power relationships between farmers and buyers are rebalanced. Existing chains are highly consolidated, especially at the collection, processing and retailing nodes. The development of producer organizations should be continued, as started in Flemish dairy sector those last years, so that farmers can gain power and negotiate more favorable transactions modalities, including stable and higher prices (Bijttebier et al. 2017). However, there are few chances that dairy farmers will achieve this, if processors continue targeting export and bulk markets, and if milk production continue increasing as it does since the end of dairy quotas.

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<sup>64</sup> In Belgium, housing expenses amount 30 % in 2018 (Statbel 2019) (including energy and water)

On the downstream side of value chains, there is a need for competition laws restraining the abuse of dominant buyer power, by e.g. a better control of merges and acquisitions of processors and retailers (De Schutter 2010; Mooney 2017).

#### ***4.2 Testing the relevance of our S-LCA framework and the method used***

##### **Putting forward chain governance and transaction modalities, in addition to social aspects**

As just mentioned, our framework seems to be useful to increase the transparency on how chains function, on the actual costs which are behind products and services and on the social conditions that prevail in actual chains. An assessment framework like the one we developed seems useful to look at the assessment object in a systematic manner. However, many elements could be captured through the selected indicators and calculations, and it seems important to not stick to indicators only and to open the assessment to other aspects, when needed.

##### **Calculating cost prices and actual farmer incomes**

The exercise of calculating costs prices and actual farmer incomes with Trésogest and methodological extension for labour costs was useful to unveil issues that management accounting that is predominantly used does not unveil because it is not based on actual expenses. It was useful even more because we did not expect the results that we found. The gap between what we found with Tresogest in terms of actual income and what is found by management accounting to reflect farm profitability for some of the assessed farms raises questions. It raises questions about the tools that are mainly used by farms to monitor economic results of their activity but also over the results of cost price calculations using the accounting-based approach, since the fictive costs used can differ substantially from actual costs (e.g. for investment costs).

Thus, it would be useful to do more research on tools to calculate costs prices, to compare methods and results, but also to engage discussions with chain actors about tools and approaches to be used (treasury versus accounting-based).

##### **Calculating preventative costs and assessing the price fairness**

The exercise to calculate preventative costs for milk at the specific node of farming proved to be useful to show what would be the price implications if farmer and workers would be paid fairly, according to the chosen threshold. In that context, the relevance of extending this exercise to other chain actors is even more apparent.

This chosen threshold has important implications on results and should thus be kept in mind when looking at results. Our choice to use industry norms could be discussed: we could have used national norms (minimum wage) or other more comparable data such as living wages which are calculated by country, using various parameters including living costs in each country, as in the study assessing the sustainability price of a t-shirt retailed in the US (Hall 2019).

However, the general idea behind those calculation seem anyway relevant to make buyers understand what pricing and price levels imply in terms of social (and environmental) conditions and impacts. The approach could be further applied, especially for those chain nodes in which the selling price relies on market prices rather than on cost prices, i.e. nodes producing or extracting commodities or primary goods, which are also considered as the most hazardous sectors (with construction) (ILO 2009).

## Supplementary material 8

Table 32: List of criteria, indicators and reference points

Criteria	Indicators	Reference Points
Chain/VCA Governance		
Chain governance and relations between VCA	Chain length	Number of intermediaries between primary producer and final user
		A. 0 B. Maximum 1 C. More than 1 D. More than 2
	Level of control of the organization	Actual ownership
		B. Most of the capital is owned by users of the organization (partners, workers, clients, suppliers) C. Most of the capital is owned by investors D. The company is quoted on the stock exchange
	Participation of other VCA in decision making	Actual and potential ownership by other VCA
		A. All capital owned by other VCA and shareholding open under conditions (e. g. producer co-op) B. Other VCA own part of the capital and shareholding open and supported (co-op) C. Other VCA might own part of the capital but shareholding by other VCA not supported or open
	Competition management	Buying obligations towards certain suppliers
		A. The purpose of the organization is to buy and sell all the supply of certain suppliers (usually its members) B. The purpose of the organization is to buy and sell products of certain suppliers in priority C. The organization has no obligation regarding sourcing
	Market power of the organization	Size of organization and market concentration
		A. Small organization in a low concentrated market B. Small organization in a concentrated market C. Big organization (< C8) in a concentrated market D. Very big organization (<C4) in a concentrated market
	Transaction modalities	
	Commitment between VCA	Contract between the buyer and the supplier
		A. Very high commitment (open-ended or with risk sharing) B. Formalized contract on several months at least C. Non-formalized commitment D. No commitment or commitment with penalties if non-compliance
		Pricing mechanism (1): Who sets the price?
		B. The supplier C. The price is negotiated D. The buyer
	Price fairness	(2): Basis to set the price
		B. On the basis of cost price C. On the basis of market or competitor's price, adapted according to specific costs, or with a multiplying factor D. On the basis of pure market price
		Coverage of the calculated fair price by the price effectively received for the product
		B. Yes C. No

Workers	Unfair trade practices	Payment term	A. Within 7 days B. Within 30 days C. Within 3 months D. After 3 months
	Profitability and autonomy of VCA		
	Profitability of VCA	Disposable income/FTE	B. If the generated income/FTE (as calculated by Tresogest) is positive C. If the generated income/FTE (as calculated by Tresogest) is negative
		Use of other gainful activity	B.No, C.Yes (including purchase and resale activity)
	Employment conditions		
	Social benefits/social security	Provision of contracts with full benefits/ employee contracts to workers (other than partners)	A. Provision of some permanent employee contracts B. Provision of some temporary employee contracts C. Non provision of any jobs D. Non-provision of any employee contracts
		Use of 'low-cost' worked hours (subsidized and daily contracts, disguised employment/'false' self-employed person, non-paid familial labour, or non-declared)	B. Non-use (except trainees) C. Use for some worked hours D. Use for most worked hours (outside of hours worked by partners)
	Stability of work contracts	Use of unstable contracts/arrangements	A. Use of open-ended contracts only B. Use of open-ended contracts mainly C. Use of temporary employee contracts for more than 10% of worked hours (outside of hours worked by partners/managers) D. Use of daily contracts (incl. temporary work) or self-employed persons
	Working conditions		
	Working time	Excessive work hours per week	A. Equivalent or less than 38 h a week B. Less than 48 h (max allowed in agriculture) C. Between 48 and 68 h a week D. More than 68 h a week
Broader societal issues	C31. Job creation	Quantity of working hours/functional unit	
	Territorial development		
	C32. Promotion of exchanges between local VCAs	% of working hours occurring in the same region as consumption	
	C33. Promotion of local labor	Use of temporary non-resident workers	
	Solidarity and reduction of inequalities		
	C34. Contribution to public expenses	% of price to tax payment and social contributions	
	C35. Reflection of all costs in price	True price (including social (and environmental) costs)/sale price	
	Food sovereignty and heritage		
% of output for food purpose			



C36. Contribution to local food needs	% of output for local markets
C37. Conservation of heritage and know-hows, incl. agricultural	Indicator not found
C38. Support to peasant and small-scale production methods and to autonomous farms	Indicator not found

## Supplementary material 9: How do our results compare with other studies?

The Table 33 below compares our results on fair prices with existing studies.

Table 33: Our results compared with other studies

Study : sample, geographical area, period, authors	Our results: 5 Belgian farms, 2016		10 Flemish farms, 2013-2014 (Bijttebier and Govaerts 2016)	227 German farms, 2013-2019* (BAL and EMB 2019)	16 organic farms in North-West of France, 2010 (IDELE 2012)	
Approach	Treasury-based	Accounting-based	Accounting-based	Accounting-based	Treasury-based	Accounting-based
	Same level of fat and proteins (7,6 g/l)			Level of fat and proteins not specified		
Operational, structural and investment costs	59,91	58,20	[46,88-47,90]	[47,78-51,83]	42,20	44,40
Subsidies and other incomes to be deducted	13,51		[11,30-11,60]	[11,26-12,70]	16,70	
Labor incomes	17,96		[13,47-13,50]	[22,02-27,61]	10,9	11,8
<b>FAIR PRICE</b>	<b>64,36</b>	<b>62,64</b>	<b>[48,2-49,9]</b>	<b>[58,53-67,50]</b>	<b>36,40</b>	<b>39,50</b>

Note: All costs are expressed per liter of organic and energy-corrected milk (ECM) containing 7,6 % of proteins and fat (4,2 g fat and 3,4 g of proteins per liter), excluding VAT. For the Bal/EMB study, results have been converted accordingly; \*Results indicate the minimum and maximum obtained over the 2014-2019 period.

As preliminary remarks, it has to be noted that results are not all expressed in the same unit. Some studies, including ours express the results in terms of energy-corrected milk, i.e. milk containing 7,6 % of fats and proteins. In other studies, the content level of milk is not specified, suggesting that the energy-content of milk has not been taken into account. Also, most calculations use the accounting-based approach (except for the study by (AFOCG 2017) which presents the results of both methods); this is why we included here the results of our calculations according to the accounting-based approach as well.

Most studies include a small amount of farms, except for the (BAL and EMB 2019) study. Included studies cover various geographical areas, and 3 different countries, this being potentially a factor explaining the differences. For example, for conventional milk, the EMB/BAL survey finds that production costs in France are around 5 cents/100 kilo higher than those of Denmark and more than 3 cents higher than those of Germany and Belgium on the other hand (BAL/EMB 2016). Within a same geographical area or country, there can be also big differences, with e.g. 15 cents difference found for conventional milk between two French regions (BAL/EMB 2014). Also, cost prices over a given period can vary a lot (e.g. +/- 15 % difference for German organic milk in 6 years) (BAL and EMB 2019).

With all this in mind, we can observe big differences between studies in general, including between studies using the same approach (from 36,40 to 67,50€/100 liters). The lowest cost prices are found by the French study, which focuses on an especially competitive region (BAL/EMB 2014). Our results and the ones of the European milk board survey of a large sample of German farms (BAL and EMB 2019) are

comparable and rank among the highest cost prices. Finally, the difference between our results and the study of (Bijttebier and Govaerts 2016) covering partly the same region show that those results should be considered with caution, with more than 12 cents difference when using the same approach (but not the exact same method).

When comparing our results and those of (Bijttebier and Govaerts 2016), main differences lie in the investment costs, in the operational costs and in the labor costs. Two of those main differences might originate in the calculation method used: regarding investment costs the amount corresponding to loan reimbursement and investment on own capital is substantially higher than the amount used for depreciation (which is itself decided on the basis of arbitrary accounting rules). This is not always the case: for some farms (older farmers), the contrary would happen, for some others (young farmers), both amounts would be equivalent (RMT Economie des filières animales 2013). Regarding labor incomes, differences partly originate in the amount chosen as income for a farmer FTE (52.281€ in our study in compliance with BAL/EMB method, against 41.0641 € for the other one). The amount of income for a farmer FTE is an arbitrary choice as well. In our case, it relies on the hourly wage chosen, but also on the number of working hours considered per FTE. This latter amount might be underestimated given that the BAL/EMB figures used correspond to the average number of hours worked in a Belgian farm (whatever the type of farming).

Thus, while our results are drawn from a too small sample to draw any straightforward conclusions, it seems that the accounting-based approach can induce the underestimation (or the overestimation) of some important cost items; in other words the results of (Bijttebier and Govaerts 2016) would have been probably different if the approach based on actual expenses would have been used. Also, the income parameter representing a substantial part of the cost price has strong implications on the overall level of the cost price.

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## CONCLUSION to the 3<sup>rd</sup> part: Discussing our applications and putting our framework in perspective with other S-LCA frameworks

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In this closing section of the 3<sup>rd</sup> part, we would like to put our framework for S-LCA in perspective with other S-LCA frameworks, by also looking at the results of two other applications (Dessard 2016; Moray 2019) that focused on the same object, i.e. another Belgian AFNs and but that used two other S-LCA frameworks: the Guidelines for S-LCA (Benoît and Mazijn 2009) and the Multiple Capital Model (MCM) capacities S-LCA (Garraabé and Feschet 2013). We will thus compare what both frameworks and ours offer as type of results. Our objective is not to compare precise results, but rather the main conclusions that are drawn from the case studies, including identified hotspots and positive aspects, with AFNs sustainability claims in mind.

It has to be reminded that our framework was built through a participatory approach involving actors of Belgian AFNs chains, with the objective of assessing Belgian food chains, including AFNs, but also mainstream chains. On the other hand, the Guidelines for S-LCA and the MCM Capacities S-LCA were not developed to assess AFNs specifically but to assess any chain (whatever the product, the geographical area or the type of chain). We can thus expect our framework to be able to capture specific aspects or potential impacts of Western food chains or AFNs chains, more than the two others. At the same time, the two other frameworks are meant to be applicable to any context and to any chains. With this comparison work, we also want to check whether generic assessment tools can be effectively relevant to any context and chain, and to which extent it is useful to develop specific frameworks for S-LCA, like ours which is dedicated to the assessment of Belgian food chains.

Also, it has to be noted that assessed AFNs are different between the three studies, and our scope was broader (cf. 1.1). Thus, differences that might be observed between the three applications may come from the applied frameworks (or from the applications that were made thereof), from the differences between the assessed AFNs and from the different scopes.

With all this in mind, our final objective is to identify main features of the three frameworks on the basis of related applications, including strengths and weaknesses of our framework in this perspective.

### 1. Materials and method

#### 1.1 Material

##### 1.1.1 The two applications of the Guidelines and of the MCM capacities S-LCA

###### Assessed product and alternative

The two Master theses assess the social sustainability of fresh vegetables produced by an organic, small-scale and diversified (in terms of produces) farm located in Wallonia and traded by the producer co-op as food baskets sold directly to final consumers or in its own shops. The producer co-op is an “ecological cooperative of farmers and consumers” created in 2010. It gathers around 40 small-scale organic farmers and processors located in Wallonia (the French-speaking part of Belgium). Farmers and processors deliver the co-op directly generally once a week, and the co-op takes care of the retailing, including in its own shops and by dispatching food baskets in Wallonia and in Brussels. In the case of the food baskets, contrary to CSAs, there is no commitment, and consumers order their basket every week.

## Product system and system boundaries

Starting from the primary production, the product system is rather simple and includes the primary production, the retailing (done by the producer co-op), final consumption and the product end-of-life (cf. Figure 31). In the case of vegetables, primary producers are market gardeners located in Wallonia. The producer co-op gathers produces from farmers, do the conditioning of products and baskets and finally delivers it to consumers or sells it in the shops. For the two case studies, only the primary production and the retailing were included in the assessment.

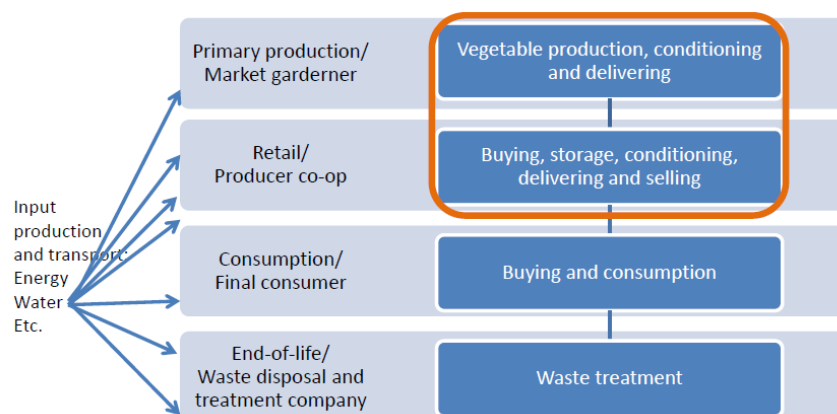


Figure 31: Product system and boundary of the applications of the Guidelines and the MCM Capacities S-LCA  
Note: The orange line indicates the system boundaries of the study.

## Assessed criteria and indicators

### Study applying the Guidelines for S-LCA

The study applying the Guidelines includes all recommended stakeholder categories and most subcategories (cf. Table 34), except for five of them<sup>65</sup>, because those were judged non-relevant to the geographical context of the study or non-operational with regards to the assessment method used.

Indicators are the ones proposed by the Subcategory assessment method (SAM) (Ramirez et al. 2014) which are themselves drawn from the “UNEP/SETAC methodological sheets (Benoît et al. 2013), but also international agreements, national [Italian] legislation and other sources relating to organizational management [...]” (Moray 2019, 64).

### Study applying the MCM Capacities S-LCA

In the MCM Capacities S-LCA, rather than performances, are assessed « the impact of actions of companies (for each chain level, for each stakeholder category and for each capital category) on the transformation of individual endowments into additional functioning capacities” (Feschet 2014, 246). The objective is to “measure the variations of capacities of actors that stem from practices of companies” (Feschet 2014, 250). Indicators are classified according to capitals, capital subclasses (cf. Table 35) and classes of potential effects of capacities. Those indicators reflect the conditions for potential effects of capacities to occur/happen.

According to the interviewed/surveyed stakeholders (farm and co-op managers and workers), a selection of those indicators<sup>66</sup> has been done on the basis of three main criteria:

- « The assumption that the country and the industry comply to international regulation

<sup>65</sup> i.e. the following subcategories: promoting social responsibility, child labor, delocalization and migration, respect of indigenous rights and prevention and mitigation of armed conflicts.

<sup>66</sup> The full list of assessed indicators can be found in annexes 2-4 of the Msc thesis (Dessard 2016).

- Considering the level of development of each country and region
- Considering industry's practices » (Dessard 2016, 58).

Table 34: Stakeholders and sub- categories of the Guidelines for S-LCA (Benoît and Mazijn 2009)

Stakeholder categories	Subcategories
Stakeholder "worker"	Freedom of Association and Collective Bargaining Child Labour Fair Salary Working Hours Forced Labour Equal opportunities/Discrimination Health and Safety Social Benefits/Social Security
Stakeholder "consumer"	Health & Safety Feedback Mechanism Consumer Privacy Transparency End of life responsibility
Stakeholder "local community"	Access to material resources Access to immaterial resources Delocalization and Migration Cultural Heritage Safe & healthy living conditions Respect of indigenous rights Community engagement Local employment Secure living conditions
Stakeholder "society"	Public commitments to sustainability issues Contribution to economic development Prevention & mitigation of armed conflicts Technology development Corruption
Value chain actors* not including consumers	Fair competition Promoting social responsibility Supplier relationships Respect of intellectual property rights

Table 35: Subclasses of capitals of the MCM Capacities S-LCA (Feschet 2014, 253)

Classes de capital	Sous Classes de Capital
Capital humain	1 Education
	2 Conditions de travail
	3 Santé
	4 Sécurité
	5 Parité
Capital Technique	6 Entreprises
	7 Infrastructures
	8 Informations
	9 Marchés
	10 Administration
Capital Financier	11 Subvention
	12 Capitaux propres
	13 Epargne
	14 Ressources publiques
	15 Crédit
Capital Social	16 Justice/équité
	17 Participation
	18 Confiance
	19 Intégration et culture
	20 Réseaux sociaux
Capital Institutionnel	21 Règles de protection
	22 Règles de surveillance
	23 Règles de régulation
	24 Règles de couverture
	25 Règles d'arbitrage

## Inventory

Only specific data were used in the assessment, with a collection of data through interviews (for managers) and questionnaires (for workers). While around 20 market gardeners supply the co-op, data were collected at one farm only, this farm being supposed as representative of the bunch of vegetable suppliers of the co-op.

## LCIA and interpretation

The study applying the Guidelines uses the subcategory assessment method (SAM) to transform qualitative data into semi-quantitative data (Ramirez et al. 2014), similarly to what we have done in our application for type I/reference scale assessment (cf. 2. of chapter 6).

The study applying the MCM capacities S-LCA apply a different impact assessment method which does not use performance reference points like the SAM does, since the objective is not to assess performances. The objective is rather to assess the impacts on potential and even effective capacities of actors, that stem from company's practices, "the variations in capacities being variations affecting the different stocks of capitals" (Feschet 2014, 250). The results are an increase or a decrease in the stock of capitals. The case study assessed the *potential* capacities variations<sup>67</sup> only, meaning that the entire method could not be applied. More details on the respective methods can be found in the respective Master thesis (Moray 2019; Dessard 2016).

### 1.1.2 Compared to our application of vegetables traded under 3 different AFNs

We compare those two applications with the assessment made in Chapter 6 for fresh vegetables only. This means that this comparison includes the assessment of fresh vegetables traded under:

- CSAs;
- The webshop;
- The organic shop (short and longer chain).

As a reminder, for those 3 AFNs, we assessed the social sustainability of vegetables along their life cycle from primary production to final consumption. An additional life cycle stage is thus included when comparing with the two other studies (the final consumption stage).

## 1.2 Method

In order to put results of the three studies in perspective, we retrieve the main conclusions of the three studies, including the identified hotspots and positive aspects. This means that we look for topics or aspects that the study makes stand out, in a positive or a negative way; we look for the highlighted alternativeness of the assessed chain, regardless of whether it is in terms of characteristic/functioning of the chain or in terms of potential impacts. We analyze what kinds of results are produced by each application, as well as the use that can be done of those results. Then, we check the consistency of main results between the three studies, and whether some highlighted aspects are lacking in each study, by also comparing with the literature on AFNs characteristics and potential impacts (on the basis of the introduction of this 3<sup>rd</sup> application part. We do not aim to check the consistency of results criteria by criteria, but to check what is highlighted by each study. Regarding AFNs potential impacts, there is anyway not one unanimous view, as demonstrated by the short literature review in the introduction of this 3<sup>rd</sup> part. On this basis, we will be able to put our framework in perspective with the two others, to highlight main features of each of them as well as the strengths and weaknesses of our applications and logically of our framework.

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<sup>67</sup> And assessed indicators of conditions of potential effects of capacities (indicateurs de conditions d'effets potentiels de capacité).

## 2. Putting our results in perspective with two other studies

As a first remark, it is interesting to note the different results that three studies can produce, while those look at a similar object and use the same tool (S-LCA), but not the same approach or framework: we can observe from Table 36 that the highlighted aspects are generally not the same according to the three studies: none of the hotspot or positive highlighted aspect are mentioned by the three studies together, and only some of them are highlighted by two of the three studies.

### *2.1 Main results of the three studies*

According to the application of the Guidelines, positive aspects are to be found at the level of workers (because the co-op favors disabled persons), consumers (traded products are organic and the co-op has implemented a feedback mechanism to receive potential complaints) and local communities (both VCAs promote local employment and the co-op implements various initiatives for the community). On the other hand, a lack of trade union membership and of policy to prevent accidents at farm level are reported (worker), and a lack of transparency, of end-of life responsibility by both VCAs, and of feedback mechanism by the farm are also reported (consumer). Also, VCAs do not contribute to improving access to immaterial resources and to heritage (local community) and there is a lack of policy to prevent corruption by both actors and of participation to R&D activities by the farm (society).

According to the application of the MCM Capacities, capitals where increases in capacities dominate for both VCAs are the social capital (including at the level of justice and fairness, confidence, network, participation and integration/culture) and human capital (including at the level of working conditions, parity and safety). For human capital, decreases in capacities are found in the working conditions (no policy to prevent physical risks, excessing work hours by farmers and poor employment conditions in farms), while for social capital, decreases in capacities are found at in the too low wages of farm workers. A large increase in capacities is found in the technical capital at the company level (because of the contribution to local development and employment and to the development of partnerships and information exchange), as well as a decrease in capacities (because of the lack of provision of access to information for other stakeholders). Last capitals, financial and institutional are the ones that account for the lowest increases and the highest decreases in capacities. Decreases in financial capital concern savings for both actors and assets for the co-op and those in institutional capitals concern the lack of protection and monitoring rules at farm level.

According to our application of chapter 6, in many aspects, products from the four assessed AFNs seem to make a difference in comparison to mainstream chains, including on product satisfaction and trust, work satisfaction, felt recognition by VCAs and the governance at the retail level. However, this is not the case of profitability, income and employment conditions in farms. When, looking at the upstream level of those chains, we can observe a reproduction of some of the peculiarities of mainstream chains, with the use of dominant wholesalers, the presence of similar bottlenecks, the lack of commitment and unfair pricing mechanisms. Those poor performance in terms of chain governance and transaction modalities could provide potential explanations for the poor social performances observed at the level of farms and their workers. In order to improve social performances at the level of farms, it seems that pricing mechanisms should be modified so that producer prices reflect cost prices (including decent incomes for farmers and workers), rather than market prices. There seems to be a room for maneuver in those chains, since consumers belongs to upper socio-professional groups. However, for this to happen, power relations between VCAs should be rebalanced, and typical bottlenecks of the food industry should be dismantled.

Table 36: Comparison of results to highlight AFNs characteristics and claims.

Note: in greens are the results highlighted in the AFNs literature

Identified positive aspects or impacts			
	Application of the Guidelines for S-LCA	Application of the MCM Capacities S-LCA	Application with Our S-LCA framework
<b>Value chain actors (VCAs)</b>		Institutional capital (co-op) Social capital: trust, staff, exchanges, partnerships (both VCAs) Financial capital: Access to loans (farm)	Trust in trading relationship, felt recognition and understanding (farms of all chains) Fair pricing and immediate payment term (webshop) Commitment between VCAs (CSAs) Chain length (CSAs)
<b>Workers</b>	Equal opportunities (positive discrimination) (co-op)	Promotion of dialogue with workers (both VCAs) Health and safety for workers (non-use of chemical inputs) (farm) Human capital: Work satisfaction (including autonomy) (both VCAs)	Work satisfaction for farmers (good) Provision of contracts with full benefits (longer chains VCAs)
<b>Consumers</b>	Feedback mechanism (satisfaction survey) Health and safety for consumers (organic labels) (both VCAs)		Consumer trust regarding food safety and satisfaction regarding taste, transparency and affordability (good) Consumer education (effective)
<b>Local communities (LCs)</b>	Local employment (both VCAs) Community commitment (co-op)	Technical capital: contribution to local development (short chains) and employment (local employees) Development of partnerships and information exchange	



Identified hotspots			
	Application of the Guidelines for S-LCA	Application of the MCM Capacities S-LCA	Application with our S-LCA framework
<b>Value chain actors (VCAs)</b>		Financial capital: No increase of company's savings (both VCAs)	Low profitability/income (short chains farmers, shop) Chain length and lack of control (shop) Lack of participation of other VCAs (wholesaler) Lack of competition management (wholesaler, shop) Excess of market power (wholesaler) Lack of commitment (webshop, wholesalers, shop) Unfair pricing (CSA, wholesaler, shop) Lack of recognition and understanding (wholesaler, shop)
<b>Workers</b>	Freedom of association and collective bargaining (lack of membership to trade unions) and Health and safety (no policy to prevent accidents) (farm)	Lack of rules of procedures and of a protocol to prevent material (institutional capital) and physical risks (human capital) (farm) Social capital: Poor income; human capital: employment conditions (farm) Human capital : Excessive work hours for managers (both VCAs)	Poor employment conditions (farms of all chains, shop) Excessive working time, felt work hardness, low work satisfaction/pay (farms of all chains)
<b>Consumers</b>	Lack of feedback mechanism (farm) Transparency (no CSR report) and End of life responsibility (no information policy) (both VCAs)	Technical capital: Lack of provision of information (both VCAs)	Low product accessibility for vulnerable people (all chains)
<b>Local communities (LCs)</b>	Access to immaterial resources (no contribution to improving access to services for the community or knowledge sharing) and Cultural heritage (no organization of event contributing to heritage) (both VCAs)		
<b>Society</b>	Corruption (no prevention policy) (both VCAs) Technological development (no participation to R&D) (farm)		

## 2.2 Main features of the three applications

On the basis of those results, we can draw main features of the three applications, that distinguish them from each other's (cf. Table 37).

Table 37: Main features of the three applications

	Application of the Guidelines for S-LCA	Application of the MCM Capacities S-LCA	Application of our framework
<b>Kind of results</b>	Performances of companies	Variations in potential capacities	Performances of companies
<b>Result usability</b>	Identification of hotspots and positive aspects	Identification of increases and decreases in potential capacities	Identification of hotspots and positive aspects, of potential stressors and of potential improvement levers
<b>Match between results and AFNs claims</b>	Mismatch	Match	Not applicable
<b>Neglected issues</b>	'Value chain actors' issues	'Society' issues	'Society' and 'local community' issues
<b>Conclusion regarding framework applicability</b>	Not directly applicable to small enterprises	Not directly applicable to small enterprises	Not directly applicable to other than Belgian food chains

### 2.2.1 Kind of results and their usability

While the applications of the Guidelines and our framework assess performances of companies, the application of the MCM Capacities S-LCA assesses variations in potential capacities of actors (workers and VCAs). However, it has to be noted that to assess variations in potential capacities, the MCM Capacities S-LCA uses the same kind of information as the two other frameworks, i.e. standards or norms. In order to assess variations in real capacities, impact pathways should be integrated in the assessment, what was not done for this application. As highlighted by (Feschet 2014a, 264), "a potential capacity can become real but not immediately, or can also never become real". In order for the MCM Capacities S-LCA to assess variations in real capacities, there is a need to include established relationships (or impact pathways). Those relationships exist for some assets, but research is needed to develop others, and even there, a relationship that has been verified in a certain context, might not be usable in another context: "Even when relations between asset variations are demonstrated, those can be contingent on a situation or a period, and may be hardly transferable" (Ibid).

This is one of the reasons why we propose S-LCA to be used as a way to verify causal relationships that have been identified elsewhere (and described through a theory, as the one we used). In this way, we are able to go beyond the identification of hotspots and positive aspects (or increases/decreases in potential capacities), and to analyze potential stressors of hotspots as well as to identify potential improvement levers.

Our proposal functions however for observable variables only, and can thus hardly be applied to the kind a relationship targeted by the MCM Capacities S-LCA. But it functions for relationships linking

various practices of life cycle companies, such as, practices of a retailer towards its suppliers, and practices of suppliers towards their own workers.

Finally, one major difference is that the relationships that we target regard distinct phenomena, i.e. an action and its unintended results, while relationships targeted by the MCM Capacities S-LCA mainly regard an action and its intended results (results of an action of a company – such as providing a training - on actor's capacities – such as increase in productivity) (though (Feschet 2014) mentions that impact pathways could serve to include relations between various capitals/assets, the focus does not seem to be on those types of relationships).

## 2.2.2 Coverage and applicability of the three applications

### Application of the Guidelines for S-LCA

Overall, when comparing with AFNs claims (fulfilled or not), the Guidelines seem to be less equipped to highlight AFNs characteristics or impacts than the two other frameworks, with much less highlighted aspects corresponding to AFN claims than the two other frameworks.

#### *Match between highlighted aspects and AFNs claims*

In the Guidelines application, the highlighted positive aspects match partially what is said in the literature (including on consumer health and safety and on local employment and community engagement), while other, less specific aspects are highlighted (equal opportunity policy regarding workers and the feedback mechanism towards consumers implemented by the co-op). Also, highlighted hotspots do not really match AFNs characteristics and unfulfilled promises described in the literature, and seem also disconnected from what we can expect from such companies.

#### *Lack of relevance of the subcategories (or of chosen indicators) for the studied case?*

For a number of those hotspots, it seems that subcategories are not adapted to the various specificities of the assessment object, including the size of the life cycle companies (SMEs/MNCs; e.g. lack of transparency/CSR reporting), the type of chain (short versus long/globalized chain; e.g. lack of consumer feedback mechanism for the farm), the industry (including type of farming) (e.g. end-of-life responsibility, health and safety for workers, cultural heritage), and the geographical context (Northern/Southern context; e.g. lack of policy to prevent corruption, to contribute to access to immaterial resources or to ensure freedom of association and collective bargaining) (Moray 2019).

#### *Overlooked issues*

Main topics that are overlooked by the application (and which are highlighted by the two other applications) are the issues of excessive working time by farmers and of employment conditions in farms. For the former one, it originates in the fact that working conditions of farmers are generally not included in studies applying the Guidelines since those are considered as VCAs, and not as workers. Similarly, farmer remuneration is also not considered, while there is a subcategory dedicated to assess the fairness of wages of (farm) workers.

Regarding employment conditions of farm workers, the subcategories “social benefits/security” should be able to capture at least partly poor employment conditions. However, the case study does not make apparent the poor social security that workers of this farm benefit from (contrary to the other case study applying the MCM Capacities). Also, while this latter subcategory captures the lack of social benefits that are implied by the diverse forms of non-standard employment, it does not capture the lack of job security.

We have understood from the discussions within the S-LCA research community<sup>68</sup> that the subcategory ‘employment conditions’ might not have been included because there are cases where contracts/status of workers are the choice of the worker, and cannot be used as a criteria to judge the social performance of a company. Given the increase in non-standard form of employment and the decline of employee contracts (providing generally maximum social benefits), it seems crucial to include this criteria. Incidentally, in the latest version of the Guidelines (which is still in discussion), a new subcategory corresponding to ‘employment relationship’ has been added (Social LC Alliance 2018).

Other topics that are missing from the Guidelines application are the ones linked to value chain actors, for which there exists yet four related subcategories. While one of the retailers is a producer co-op that was created by its suppliers and that provides them with a priori more favorable conditions than mainstream buyers, the assessment does not reflect this. The SAM provides a reference scale including B (basic requirement to be fulfilled), C and D grades (corresponding to non-complying behaviors), but no guidelines on the A grade (proactive behavior that goes beyond the ‘Basic requirements’). Our framework (or the Fair trade principles) could be used to define those proactive behaviors.

### **Application of the MCM Capacities S-LCA**

#### *Match between highlighted aspects and AFNs claims*

On the contrary, application of the MCM capacities mainly highlights negative and positive aspects that have been described in the literature, as our application (cf. Table 36). Regarding the application of our framework, it can be argued that this result is not surprising given that it has been designed to assess AFNs chains. However, it is not the case of the MCM Capacities framework, which was not designed to assess AFNs. This result can be considered as an indication of the generic character of the MCM capacities S-LCA, contrary to the Guidelines for S-LCA (and related SAM).

#### *A broad spectrum that makes the framework able to capture more aspects?*

While the MCM capacities framework is not meant to assess products from AFNs, it appears thus quite efficient to highlight AFNs claims, both fulfilled and unfulfilled. This could originate in the broad spectrum of the framework: it includes indicators linked to financial, institutional and technical capitals, in addition to human and social capitals, which are not necessarily represented in the Guidelines list of subcategories. However, the high number of indicators to be assessed (more than hundred to be applied to each chain actor) makes the assessment time-consuming and not easily applicable (Dessard 2016).

#### *The difficulty of adapting indicators to assessed companies*

On the other hand, and similarly to the Guidelines, some of the MCM Capacities S-LCA are not adaptable to the diversity of actors, including small-scale companies. While authors advise the list of sub-classes and indicators to be adapted to the local context “in order to consider structural and functional specificities of companies” (Feschet 2014a, 256), the fact that those have been primarily built for big companies makes them difficult to adapt (Dessard 2016).

For some other indicators, it might be an issue of formulation and the example of the indicator on CSR is meaningful in this regard: interviewed managers replied that they do not implement CSR but the way they conduct their activity match CSR basic principles (e.g. by taking into account interests of stakeholders such as suppliers, buyers, local communities and by behaving in a coherent way towards those in day-to-day operations), even if they do not publish a CSR report each year. There might be a need to make indicators more meaningful (also because there are many understandings of CSR policy,

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<sup>68</sup> Including the discussions taking place during the Social LC Alliance working group.

cf. 2.2.2 of introduction) and indicative of their deep content (referring to CSR principles to be compliant with than to CSR reports).

Also, for some other indicators, it seems that the construction of indicators has been guided by a certain vision of economics, that is not necessarily universally shared (Dessard 2016). For example, some of the indicators state that the increase in own capital or profit lead to an increase in potential capacities of actors. This particular vision of economics came into conflict with the ethics of the assessed companies, whose goal is to make trading relationships fairer and more transparent, rather than e.g. increasing benefits and own capital.

Thus, while the application of the MCM Capacities S-LCA seems to make it to highlight a number of AFN claims, a number of indicators were found not relevant for the assessed case, pointing to a lack of genericity.

### **Application of our framework**

This comparison highlights that hotspots and positive aspects highlighted by our application correspond to AFNs claims. This result is logical given that our framework was built with AFNs chain actors and should reflect their concerns and their sustainability vision, that are logically present in their practices and ways of functioning. However, it also shows the relative importance given to some issues: those linked to value chain actors, chain governance and socioeconomic issues for workers, to a lesser extent to socioeconomic issues, product utility or satisfaction for consumers,; and the relative neglect of some others.

#### *Overlooked issues*

Practically none issues falling under the stakeholder categories 'local community' and 'society' were indeed assessed in our applications. Yet the initial co-created sustainability vision and the resulting list of principles and criteria include issues relating to those stakeholders (those classified under 'Broader societal issues' in table 10 of chapter 5). This is also the case of issues linked to health and safety aspects for consumers and workers, which are only partially addressed in our applications.

Those issues disappeared from the initial view for various reasons:

- The lack of access to data, including at all life cycle stages (e.g. efficiency of processes along the chain, contribution to public expenses);
- The lack of personal knowledge to handle the issue (e.g. safety of working conditions, assessed by the use of harmful biological and chemical agents; animal welfare; nutritional quality; heritage protection);
- The unclear link with the product life cycle (e.g. criteria relating to autonomy of VCAs, to territorial development or to food sovereignty);

#### *The role of the theoretical approach used*

A posteriori, it seems that the chosen theoretical framework (Global commodity chain approach) played also a role in that selection of C&I to be assessed in the applications: the assessment leaves a broad space for governance and socioeconomic issues, especially for value chain actors and their workers.

Our priority was to use a coherent narrative able to help the understanding of results, rather than to provide a comprehensive picture of product social sustainability. We wanted to prevent a C&I list alike a "liste à la Prévert", that would have lacked a conceptual and theoretical approach able to shape an analytical tool going beyond the mere description of results (Feschet 2014a). It can be argued that this way of doing implies a certain bias that could have even altered the result of the co-creation process.

Rather than altering, our objective was to give more meaning to what was co-created, and to the results of our applications.

### 3. Main conclusion over the strengths and weaknesses of our framework

As a conclusion, we retain the following strengths and weaknesses of our applications, and eventually of our framework, as summarized in Table 38.

*Table 38: Strengths and weaknesses of our framework*

	Strengths	Weaknesses
<b>In terms of C&amp;I coverage</b>	Development of C&I on overlooked aspects in S-LCA, including value chain actors (incl. relations between them), socioeconomic aspects for workers (incl. managers) and consumers	Non-consideration of some issues and stakeholders, incl. local communities and “society”
<b>In terms of results usability</b>	Going beyond the mere identification of hotspots and positive aspects, with the analysis of potential stressors and the identification of improvement levers	Mainly socioeconomic issues, not applicable to non-observable phenomena and not confirming causal relationships
<b>In terms of framework applicability</b>	Generic character of our indicators, in terms of chain and actor types (alternative versus mainstream)	Applicability of our framework to other industry and geographical context to be demonstrated

Thanks to the theoretical approach used to articulate C&I, we could **analyze relationships between indicators, provide insights to understand results and identify potential stressors of negative performances and improvement levers**. This was not the case of the two applications of the Guidelines for S-LCA and of the MCM Capacities S-LCA. For the latter one, it should be reminded that the framework has been conceived to go further than the assessment of the *potential* capacities variations as was done in the study of (Dessard 2016), and to assess *effective* capacities variations, nay relations between various capitals/assets. However, such an extension relies on research development in the field of impact pathways (Feschet 2014a).

However, it has to be noted that given the method as well as the sample used, **those identified relationships are not confirmed** and remain at the level of potential impacts or stressors. In addition, our applications **overlook some issues** that were identified initially and could not be assessed properly or did not fit the theoretical framework that we chose to articulate C&Is. This includes health issues for workers and consumers, broader societal issues, including local communities.

On the other side, we could **develop C&Is (including PRPs) on several aspects that are usually not well covered** by S-LCA frameworks and studies, including value chain actors (including relations between them), workers (including on employment conditions) and final consumers (cf. chapters 1 and 5, (Sureau et al. 2017; 2019b; Kühnen and Hahn 2017).

One could argue that those C&Is are very specific to AFNs and cannot be used for further S-LCA studies going beyond the scope of Belgian AFNs. However, as our applications also show, AFNs are diverse, as well as actors participating in AFNs (in terms of activity/location in the chain, but also in terms of size, status, proprietorship, targeted markets). Those actors participate for some of them to mainstream chains as well. Also, their practices and ways of functioning are very diverse, and it is actually difficult to classify one actor or one chain as alternative (e.g. the organic shop which is alternative on some aspects

only, cf. chapter 6). Finally, we compared those alternative chains to the equivalent mainstream chain, whenever possible. One challenge in configuring this framework was thus to build indicators applicable to and fitting any kinds of chains, actors and practices. In a way, our indicators seem more generic than indicators of the SAM and of the MCM Capacities S-LCA, since we prevented the applicability issue by configuring a framework being able to assess several and distinct chains and actors. Thus, while it has been built with the participation of AFNs actors, our framework is **not specific to AFNs since it is able to assess the broad spectrum of AFNs as well as mainstream chains**.

However it is likely that the **genericity of our framework is partial only**; and its applicability to other product chains and other geographical contexts is still to be demonstrated.

Thus, rather than to argue for the building of specific frameworks, we would argue for the building of frameworks reflecting the diversity of actors, chains and practices. We think we could get close to this result with our application (chapter 5) on one hand by confronting diverse visions of what is a (socially) sustainable food system, and indirectly of how sustainability can be achieved and on the other hand by configuring a tool able to assess a range of alternative chains and actors, in addition to mainstream chains.





# CONCLUSION

## 1. Synthesis of our research work and of our results

In the framework of the current methodological development of S-LCA, we focused initially on two main research questions which spur on the research on S-LCA since 15 years. The first one relates to what should be assessed in S-LCA, i.e. which criteria should be the focus of the assessment and what they should reflect. The second one relates to how to go beyond the mere reporting of social performances (that is called type I or Reference scale assessment) and to assess potential social impacts (that is called type II or Impact pathways assessment).

Though those two questions are inherently linked, we conducted initially two main distinct states of the art, focusing each on one question mainly. **In the first chapter**, we analyzed 14 existing S-LCA frameworks proposed since 2005, and more particularly their assessment C&I. We found that diverse starting materials and ways to select C&I are used, including within frameworks and we could distinguish five main types of frameworks, according to the content and format of the list of C&I: universal values-based, contextualized values-based, theory-structured, impact-pathway based and applicability oriented. Also, we found that their focus is mainly on the production stage, the use stage and value chain actors being neglected by C&I of existing frameworks. Finally, most frameworks assess practices of life cycle companies towards other actors, so that social performances or social risks are mainly assessed, while some of them recommend to relate those to further impacts on human wellbeing, but without specifying how. As main recommendations, we encourage the use of assessment criteria that are legitimate and meaningful for stakeholders, and that cover relevant stakeholders for product life cycles, including value chain actors and consumers, and relevant aspects, including economic aspects and chain governance. In addition, given the S-LCA promise to provide a holistic assessment, the variables included should be envisaged as elements of a product system and that must be branded according to their position in relation to other elements.

Those S-LCA papers considering impact pathways or the effective assessment of potential social impacts (or type II studies) were the focus of **our second chapter**. We analyzed 28 articles and found again a certain diversity in terms of purpose, methods and topics. Within studies investigating or implementing pathways, case studies focus on quantifiable aspects only, namely the exposure to certain substances impacts on health, and the effects of incomes generated by product life cycles on the access to basic needs and on health. Those covered issues contrast with issues assessed in type I studies, this highlighting a big gap between the two S-LCA types. Our findings indicate the opportunity of extending future Type II S-LCA research to variables tackled in Type I studies (e.g. employment and working conditions), beyond pathways focusing on health impacts. However, rather than looking downstream impact pathways (investigating the endpoint impacts on wellbeing and health), we would recommend those studies to look upstream impact pathways (investigating the root causes of poor employment and working conditions). This can be done by using theories from social sciences for the identification of impact pathways. Those could then further be investigated through statistical approaches or in the framework of S-LCA case studies, with specific data and potentially more qualitative methods to analyze causality or social mechanisms.

**In the third chapter**, we looked at S-LCA studies in our application field and analyzed the empirical results of 15 studies and the use that is or that can be done with those results. We found that reviewed studies have two main objectives: the improvement of the social sustainability of product life cycles (those identify hotspots in product chains, i.e. most impacting processes and most worrying issues) and the choice of the best option to be implemented (those studies compare different scenarios for a product life cycle). Under certain conditions, the latter produces directly useable results to inform decision making. On the other hand, for the former, there seems to be a missing link for identifying improvement options when those studies do not consider the reasons for social hotspots to exist. When interpreting results, studies that compare results across life cycle stages and that link indicators with each other's (instead of considering indicators separately) make it to identify potential stressors and improvement levers. However, this requires the assessment to be sufficiently broad and the right indicators to be selected beforehand. As a main suggestion, S-LCA could be used to help the understanding of mechanisms that lead to low or high social sustainability, in other words to uncover or verify potential impact pathways.

Those three states of the art focusing each one on specific aspects relating to S-LCA (frameworks, type II/impact pathways studies, case studies), led us to develop methodological proposals addressing specific questions for the building and implementation of S-LCA and that we presented in the second part of this PhD. Methodological proposals described **in the fourth chapter** can be summarized as following: in brief, we argue for the use of a participatory approach involving actors of product chains to select assessment criteria. Assessment criteria should be selected among all sustainability pillars, beyond the 'social' pillars and the three-pillar approach, to cover also governance and economic pillars, thus contributing to the discussion about the content and the drivers of (social) sustainability. We also argue for a LCIA bridging type I and type II, with impact pathways drawn from theory (including in social sciences), looking upstream, towards the root causes of main problems in supply chains requiring urgent action, such as inequalities, remuneration, employment and working conditions, and thus including qualitative variables and methods as well. Finally, we argue for the use of S-LCA case studies as a way to investigate impact pathways, with the use of preferably specific data. Thus S-LCA can contribute to build knowledge on supply chains issues and relating causal mechanisms.

**In the fifth chapter**, we applied the methodological proposals relating to the building of a S-LCA framework, which is tailored to our first case study (3<sup>rd</sup> part, 6<sup>th</sup> chapter). Two main features are i) the participatory approach that we used to build the list of assessment C&I, involving actors of the assessed chains assess; and ii) the theoretical approach that we used to articulate C&I, which is the Global Commodity Chain approach (GCC), placing chain governance as main driver of value distribution along the chain, and potentially of social impacts at the level of each value chain actor, including profitability, employment and working conditions. Following the implementation of those proposals, we can conclude that the participatory approach is an appropriate method to build a list of C&Is standing out from other studies, with the identification of ambitious and innovative C&Is relating to value-chain actors (VCAs) stakeholder category, on chain governance and transaction modalities.

This framework for S-LCA is applied in a third and last part, to two case studies in order i) to test it but also ii) to draw empirical learnings on the social sustainability of products traded under various Belgian Alternative food networks (AFNs), and iii) to verify our assumption drawn from the used theoretical framework.

The application described in **the sixth chapter** corresponds to the assessment of two products (drinking milk and vegetables) traded under three Belgian AFNs which are mainly short food chain initiatives: Community-supported agriculture (CSA), a webshop, and an organic shop. With this assessment, we find that AFNs perform well in some specific aspects (consumer aspects, work satisfaction, social ties between VCAs). However performances are not as good as expected in terms of chain governance and transaction modalities since AFN chains use similar mechanisms as the ones used by mainstream chains (e.g. unbalanced chains by the organic shop chain, market-based prices by CSAs, lack of commitment between VCAs by the webshop) and those are neither good in terms of profitability and employment conditions. While this conclusion does not confirm our assumption that AFNs products are more socially sustainable, it tends to confirm our assumption that chain governance and transaction modalities, particularly fair pricing, matter for companies to perform well on profitability, employment and working conditions, and it shows that these aspects are successfully integrated in the method. However, the limited access to economic data of farms did not allow to assess the effective price unfairness for farms facing profitability issues, and providing poor employment conditions.

The second application of **the seventh chapter** addresses this gap by including the alternative economic indicator of price fairness in S-LCA and tests the applicability of our framework beyond its initial application field. It assesses the social sustainability of milk collected by a dairy co-op that is considered as a North/North Fair trade initiative. We found that the chain is more balanced than mainstream organic chains, and provides more security since prices are guaranteed. From the assessment of the situation of 5 dairy farms (over 30 co-op members at that time), according to our calculations, profitability is an issue for most of them, and farms do not seem to perform better than farms trading in conventional chains in terms of employment and working conditions. Also, prices paid to farmers are not fair since they do not cover cost prices and fair income and employment conditions for all workers, and seem similar to what is paid in mainstream organic chains. Putting those results in perspective with other similar North/north fair trade initiatives, it seems that the price level remains the crux of trading relationships. It seems that psychological factors come into play in this regard, implying potential trade-offs between environmental and social impacts. This assessment could be usefully done for other actors of the chain (processor, retailer) in order to understand if and how added value could be distributed more fairly between VCA, or if a potential price increase should be passed on to final consumers. Those results tend to demonstrate the usefulness of looking at VCA profitability and price fairness when assessing the social sustainability of products, but also that there is a need to transform mainstream chains in addition to supporting AFNs, since AFNs continue being subject to market forces.

**The conclusion of the 3<sup>rd</sup> part** puts our framework in perspective with other frameworks on the basis of our applications. To do so, we looked at the results of two other applications that focused on the same object, i.e. another Belgian AFN, but used two other S-LCA frameworks: the Guidelines for S-LCA and the Multiple Capital Model (MCM) capacities S-LCA. Overall, the latter makes it to highlight AFNs claims as our framework does, thanks to the broad spectrum of covered aspects. Also, the lack of applicability of the subcategories of the Guidelines to any kinds of chains and actors, that was already previously questioned, is confirmed by the present exercise, and the MCM capacities S-LCA would face the same applicability issue. The added value of our approach seems to be on the generic character of indicators and the coverage of value chain actors, socioeconomic aspects for workers and consumer, and product utility. Also, our framework goes beyond the mere reporting of performances. However, this feature regards some aspects only (mainly socioeconomic), while broader societal aspects are neglected. Finally the applicability of our framework to other industries and geographical contexts is to be demonstrated.

## 2. Main conclusions in the context of past and current S-LCA and broader discussions

### *2.1 Addressing our research questions*

On the basis of the research conducted in this PhD we provide answers to our three initial main research questions, which are inherently linked: i) what should be assessed in S-LCA and ii) how to assess potential social impacts or to include impact pathways in LCIA; iii) how should the assessment be carried out, so that it goes beyond a mere reporting?

Our reply to those three questions hinges on three main proposals for S-LCA:

- Explanatory: integrating impact pathways targeting root causes of socioeconomic problems;
- Holistic: integrating chain governance and economic aspects in S-LCA;
- Participatory: using a participatory approach to define assessment C&Is.

#### **2.1.1 Proposal 1: Integrating impact pathways targeting root causes of socioeconomic problems**

A starting point of this PhD was the statement that S-LCA developed as a reporting tool mainly, rather than an analytical tool, under the influence of the CSR movement. Some point to the inability of S-LCA to predict potential social impacts linked to (changes in) product life cycles, given the lack of consideration of impact pathways (Macombe and Falque 2013; Feschet 2014) .

We agree with the need for S-LCA to become an analytical tool that goes beyond reporting. But we argue that another main shortcoming of S-LCA relates to its inability to provide explanations for the reported poor performances of value chain actors regarding main socioeconomic issues linked to product life cycles, and thus to identify improvement levers. We argue that this shortcoming could be addressed by integrating impact pathways looking upstream, to the root causes, rather than downstream (to the impacts experienced by people).

One path does not exclude the other, and foremost we think that the direction to be taken depends on the issue at stake (socioeconomic issues versus issues relating to physical flows). However, for socioeconomic issues, we think that the priority should be given to the investigation of impact pathways linking to root causes of problems, given the seriousness of socioeconomic issues linked to our production and consumption modes, such as persisting cases of non-decent work and work violating human rights, inequalities between workers of both hemispheres, in terms of income, employment and working conditions and the rise of non-standard forms of employment around the world. Consequently, we think that a major task for S-LCA and related impact pathways research is to focus on the investigation of the root causes of those problems.

In fact, we know the problems, but the question of what are the main underlying causes seems to remain, or at least those are not integrated in S-LCA. Why companies in the South underpay a majority of their workers? Why poor employment and working conditions continue to prevail in some specific sectors and some specific regions? How the proliferation of global supply chains fuels the development of non-standard forms of employment? What are the causes of the uberization developing in Northern countries? There is a need to increase our understanding of related causal mechanisms and to identify precise potential root causes and improvement levers for those socioeconomic issues.

### 2.1.2 Proposal 2: Integrating chain governance and economic aspects in S-LCA...

#### Through the Global commodity chain approach

There exists research and theoretical frameworks, seeking to unveil mechanisms leading to certain practices or impacts, including in social science, that could be integrated in S-LCA. We decided to explore the Global commodity chain approach as a theoretical approach to configure our assessment framework and to articulate C&I linked mainly to socioeconomic issues. This theoretical approach is particularly relevant for assessing SSE impacts linked to product life cycle given its roots in Development studies and its focus on value chains. It analyzes the governance of product chains, i.e. authority and power relations between chain actors and places it as a main determinant of the way that goods and services are produced and traded and of the way that “financial, material and human resources are allocated and flow within a chain” (Gereffi and Fernandez-Stark 2016, 10), particularly the way that value is captured and distributed along a value chain (Lee 2010). This approach was first integrated in a PhD research seeking to include socioeconomic indicators in an E-LCA assessing food chains (Sim 2006), but not in further S-LCA research. The Guidelines for S-LCA recommend to assess subcategories on related issues with the ‘Value chain actors’ stakeholder category, but those actors are paradoxically the ones receiving the least attention in studies (cf. chapters 1, 3, 5, 8). Yet, for food chains especially, governance aspects are seen as major drivers of sustainability, as unveiled by research on the subject (Mooney 2017).

#### Results of our applications: confirmation of the relevance of integrating such aspects

Our applications show the relevance of integrating and focusing on those aspects in S-LCA. In parallel to the reporting of social performances of VCAs, the assessment of chain governance and transaction modalities between VCAs make it to highlight those mechanisms that contribute to social sustainability. With our applications we could not confirm the higher social sustainability of AFNs products, given the poor performances of farms in terms of income, employment and working conditions. But with the integration of chain governance and economic aspects in the analysis, we could bring some explanations about this existing situation (unbalanced power relations between VCA, lack of commitment, unfair pricing mechanisms). We could also point to trade-offs specific to AFNs between indicators and sustainability dimensions (commitment between VCAs versus fair pricing, financial and professional insecurity of farmers versus affluence of consumers, environmental protection versus fair employment and working conditions) and to improvement levers (a fairer distribution of added value between VCAs, prices that reflect actual costs rather than market value, an increase in food prices paid by consumers, by shifting expenses to necessities).

#### What link between theories and the empirical tool which is S-LCA?

While the use of the GCC approach was required to articulate C&I and for an analytical interpretation of results to be provided, the use of a theoretical framework meets calls of S-LCA researchers to reinforce S-LCA with theoretical grounding, including in social science, especially when it comes to impact pathways (Jørgensen et al.; Iofrida et al. 2018; Feschet 2014).

We feel that such a narrative helps give meaning to results and go beyond their mere reporting. Thus, we argue for the use of such theoretical approach, if not this one, in further S-LCA studies, particularly for the identification of impact pathways to be integrated or to be investigated. In this way, S-LCA can be used to confirm or reject theories, or to build knowledge about the mechanisms described in theories i.e. to feed existing theories. In addition to the two uses of S-LCA that we have identified (improvement of product sustainability and choice of the most sustainable option, cf. 1.3 of introduction), we propose this third complementary layer: S-LCA could help understand mechanisms leading to poor or good social

and socioeconomic impacts linked to product chains. Just as E-LCA does when uncovering processes or inputs responsible for main environmental problems in product life cycle, S-LCA could help uncover the appropriate levers to be activated by companies or to be supported by policy makers and consumers to improve social conditions.

#### **...As potential root causes of socioeconomic problems**

Coming back to the link between our first two proposals, we consider that looking at the potential root causes of problems or poor social performances of VCAs (such as unbalanced power relations and unfair value distribution between chain actors) is crucial. Otherwise, the risk is for S-LCA to become a tool through which practices/performances of some value chain actors (in most of the cases suppliers, since commissioners are often big buyers or MNCs) towards other stakeholders (e.g. workers) are reported and denounced, without providing the elements that allow to understand and to address those practices.

This point echoes with the discussion initiated in the introduction (cf. 2.2.3) over the responsibility and sphere of influence of companies, especially of big buyers and lead firms outsourcing production processes: in how far can we consider that social performances of suppliers are linked to buying practices of buyers (e.g. retailers, brand manufacturers)? Where does their responsibility stop? We argue that it is important to consider power relations between value chain actors to address those questions. While power relations and chain governance can be seen as intangible phenomena, the distribution of added value that characterize most supply chains is not. In this regard, we argue for a paradigm shift for CSR (cf. 2.2.2 of this section).

The importance of those issues was partly uncovered through the participatory approach.

#### **2.1.3 Proposal 3: S-LCA C&I based on values, and defined through participatory approaches**

Our third proposal relates to the way that assessment criteria should be selected and that indicators should be built. Many critics have been raised on the list of subcategories, some rejecting its lack of scientific grounding, its pronounced ideology and its lack of applicability to any types of actor.

##### **Normative character of assessment C&I**

As expressed in the first proposal, we argue for a S-LCA going beyond reporting, and for the inclusion of impact pathways targeting root causes of main socioeconomic problems. At the same time, we accept the value-based and the normative character of a list such as the one of the Guidelines, even if assessment criteria do not reflect impacts experienced by people but performances of companies, and even if the link of those criteria with human wellbeing and health (LCA area of protection) is not scientifically-justified or proven. This means that an area of protection could be the respect of regulations adopted at an international level, protecting basic human and worker rights.

##### **Use of a participatory approach, considering plurality and diversity**

The building of a list of C&I such as the one of the Guidelines for S-LCA is a long way, and requires time and consensus building. In the meantime that such a list is consolidated at a global level, we think that assessment C&I for S-LCA studies should be defined through participatory processes, considering the plurality and the diversity of product chains and of value chain actors, this work contributing in turn to a list of assessment criteria for S-LCA to be applicable to any chains.

### **As confirmed by our applications**

Indeed, it seems that the use of a specific framework tailored to specific chains (in terms of assessed chains, in terms of industry, of geographical context) is relevant and useful. We have seen in the conclusion of the third part that our framework did not face the applicability issue met by the Guidelines and the MCM Capacities S-LCA, because our framework was configured in a way that it fits all kinds of companies, whatever their size, location in the chain, status, or targeted market. This was made possible thanks to the multiplicity of chains that we aimed initially to assess with our framework (namely four chains), to the different functioning of those chains, and to the diversity of actors intervening in those chains. Thus, we argue for a participatory approach to configure assessment C&I in S-LCA so that it is able to take into account the existing diversity of chains and chain actors.

## ***2.2 Tying S-LCA with alternative visions of its conceptual roots***

Our proposals echo particularly with discussions occurring at various levels about the inadequate conceptual roots of LCSA and S-LCA (3-pillar approach to sustainability and current Corporate social responsibility approach), and about alternative views of those two concepts, that we would like to link to our proposals for S-LCA.

### **2.2.1 Three-pillars approach versus nested sustainability approach for S-LCA and LCSA**

We have seen along this PhD that the conceptual roots of S-LCA and LCSA correspond to the three pillars approach of sustainability, represented by the equation equating LCSA to the addition of E-LCA, LCC and S-LCA, meaning that the pillars are considered as isolated from each other's (Sala, Farioli, and Zamagni 2012; Zamagni 2012). Consequently, when performing a LCSA, three separate assessments are generally conducted.

As we have seen in the introduction, there is a lack of justification of this approach to sustainability for LCSA and S-LCA in main related publications (Kloepffer 2008b; Valdivia et al. 2011) and the LCSA definition has been challenged since then, calling the content of LCSA into question (Sala, Farioli, and Zamagni 2012; Zamagni 2012; Guinée 2016; Onat et al. 2017) and renaming it LCSA (Analysis) instead of LCSA (assessment). A discussion topic relates to the need to take into account the relationships between sustainability dimensions instead of considering the three assessments separately, in order for the system to be understood (Sala, Farioli, and Zamagni 2012; Zamagni 2012; Onat et al. 2017). As mentioned in Chapter 7, in parallel there is also a debate on the economic pillar of LCSA, and on whether LCC which focuses on costs only is the right tool to assess the economic sustainability of a product life cycle.

As shown by our reviews (chapter 1 and 5), this 3-pillar approach to sustainability directed S-LCA to exclude economic indicators, even though, initially, the Guidelines included 'Profit/prosperity' as a pillar to be assessed in S-LCA. This has also directed LCSA assessments to be run separately, so that relationships between sustainability dimensions are not effectively considered.

We thus argue for S-LCA, and LCSA, to get tied to a nested approach to sustainability, which considers relationships and trade-offs between sustainability pillars or elements. Also, as already mentioned in chapter 7, we argue for the use of alternative economic indicators in LCSA (beyond costs) and considering, in turn, sustainability, and "captur[ing] issues of equity and distribution" (Hall 2015, 1635). Those economic indicators should preferably be included in S-LCA, so that their relationships with other, socioeconomic and social indicators can be analyzed and taken into account, including as potential stressors.

### 2.2.2 Utilitarian versus Ethical CSR/Corporate social accountability

We have also seen in the introduction (cf. 2.2) that S-LCA development was strongly influenced by CSR, but a particular view of CSR. (Capron and Quairel-Lanoizelée 2007) distinguish two main visions of CSR today, reflecting those two moves (cf. Table 39): “i) a mainstream vision of companies in market economy [...] which considers CSR as a way to strengthen their legitimacy and reputations and to reduce risks, or even improve their competitiveness; which is supported by the business community [(the utilitarian vision)]; ii) a vision of companies as legal entities embedded in society, contributing to global societal stakes and to sustainable development, and which focuses on the impacts of their activities and on the responsibility resulting thereof; which is the one of civil society organization [(the ethical vision)]” (Capron and Quairel-Lanoizelée 2015, 246).

Table 39: The two CSR visions (Capron and Quairel-Lanoizelée 2015, 245–53)

Denomination	Utilitarian CSR	Ethical CSR/Corporate social accountability
<b>Consideration of stakeholder interests</b>	Instrumental value	Intrinsic value
<b>Role of CSR</b>	To strengthen legitimacy and reputation, reduce risks, improve competitiveness	To contribute to sustainable development by reducing impacts on populations and environment
<b>Content and means of CSR</b>	Reporting of positive externalities through self-designed voluntary tools and <i>local</i> modification of the functioning of the company (without questioning the business model and its compliance with sustainable development stakes)	Reporting of activities and consequences but also be accountable towards society by reducing negative impacts through binding regulations and/or through economic activity (e.g. distribution of added value, regular payment of taxes, transparency over lobbying activities)
<b>Advocated by</b>	Business community	Civil society organizations
<b>Consideration of companies in society</b>	Companies in market economy	Companies integrated in society
<b>Relation between economy and society</b>	Superficial re-embedding	Substantial re-embedding

While those two visions co-exist, the utilitarian CSR is dominant since a few decades. In this context, the parallel and similar critics made to CSR and S-LCA are not surprising. While we certainly agree with the plea for an ethical CSR to be implemented by companies (Capron and Quairel-Lanoizelée 2015), we also argue for S-LCA to be anchored to this alternative CSR view, so that business models of companies are indeed questioned and so that companies reduce their negative impact through “binding regulations and/or through economic activity (e.g. distribution of added value, regular payment of taxes, transparency over lobbying activities)”. Concretely, for S-LCA, it would mean looking at business practices (including buying practices) of companies towards other chains actors (as outlined in our proposals), but also indeed at aspects with potentially important impacts for society as a whole, such as the regular payment of taxes (excluding tax optimization practices, and obviously tax evasion) and lobbying activities. While the latter aspect of lobbying might pose some assessment challenge (how determining what is a lobbying activity with potentially detrimental effects, and what is not), those aspects seem much more important to look at than the publication of a CSR report.



## 2.3 Our proposals and frameworks put in perspective with other S-LCA approaches

Finally, we propose to summarize our proposal for S-LCA and to put them in perspective with other approaches and frameworks, on the basis of a table from (Feschet 2014a) (cf. Table 40).

With our framework, we assess mainly performances of life cycle companies, as the studies applying the Guidelines for S-LCA do. However, in addition to social results of companies (midpoint impacts), we also assess chain governance and business practices of companies (considered as potential stressors or explanatory factors of some social results). In this way, we combine both main LCIA approaches, type I and II. Our framework is to be tied to a nested approach to sustainability and to an alternative CSR vision, which is the Ethical CSR or Corporate social accountability (Capron and Quairel-Lanoizelée 2015). We aim with our framework to identify hotspots in products chains, but also to analyse potential stressors of those identified problems and to identify improvement levers.

Table 40: Comparison of various S-LCA frameworks or approaches. Adapted from (Feschet 2014a)

	Our S-LCA framework	Guidelines or performance S-LCA	MCM Capacities S-LCA	Impact pathways S-LCA
<b>Result</b>	Performances of life cycle companies	Social performances	Effects and social impacts	Effects and social impacts
<b>Assessed phenomena</b>	Chain governance, business practices and social results of companies	Social results of companies	Capacities variation and capital stock	Situation/state change
<b>Positioning on impact pathways</b>	Stressors and midpoint Combination of type I and II	Midpoint Type I	Midpoint and endpoint Type I, nay II	Midpoint and endpoint Type II
<b>Conceptual framework</b>	Ethical CSR/Corporate social accountability and nested-approach to sustainability	Utilitarian CSR and 3-pillar approach to sustainability	Multiple capital model	Areas of protection
<b>Theoretical framework</b>	Global Commodity Chain	Stakeholder theory	Human development, Capacities approach	Human development theories
<b>Usability</b>	Identification of hotspots, analysis of potential stressors and identification of improvement levers	Identification of hotspots / Marketing and communication	Identification of hotspots, socio or retro conception, decision making support	Socio or retro conception, decision making support

### 3. A look back at our research work: genesis, limits and regrets

#### *3.1 On the general methodological approach used for the PhD*

In this PhD, we used a 3-step approach, including i) the review of existing S-LCA research; ii) on this basis, the development of methodological proposals for S-LCA; and iii) the application and testing of those with case studies. While it appears a logical and relevant approach to address our objectives, such choice is however not neutral.

We reviewed S-LCA research deeply, which led to the identification of methodological issues or gaps, on which we based our methodological objectives and proposals. We could also have started differently, e.g. by investigating the application context (Belgian food systems) or by reviewing other related research streams (such as Social impact assessment, social indicators, CSR or other approaches analyzing production chains such as the ones referred to in chapter 5, 3.3). This could certainly have triggered other ideas and inputs, ‘outside the S-LCA box’. Indeed, the risk of reviewing mainly S-LCA research as a starting point of the PhD is to remain on the track of previous research.

However, S-LCA belongs to a larger suite of life cycle thinking tools, and therefore needs to comply with some life cycle thinking standards, rules and requirements. And, although it was the aim to push further the methodological development of S-LCA, it was not the aim to develop methodological advancements which could/would push S-LCA outside the ‘life cycle thinking box’. This means that in the overall approach certain limits for S-LCA development were set and accepted.

When looking back at our work, it seems that the review exercise was mainly useful to understand the issues at stake in the S-LCA research field - which were not easy to grasp in the beginning - and to identify shortcomings. It seems that we could bring ideas ‘outside the S-LCA box’ through the participatory approach that we used to build the framework. For the same task, many practitioners look mainly at what has been done in previous research, at indicators used in other social assessment tools and approaches (such as CSR). Differently, we built our assessment C&I list almost<sup>69</sup> from scratch, with the use of inputs from the participatory process involving actors from alternative chains. The results of this exercise included the setting aside of the 3-pillar approach (excluding ‘economic’ aspects from the social assessment), and the bringing in to the fore of assessment criteria that are not recommended by existing frameworks or that are barely used by practitioners.

Thus, the selection of assessment C&I with a participatory approach, which we had in mind from the beginning of the PhD, seems to have had a strong influence on the rest of the PhD. The application of this proposal started already from the second year, along with the review exercise. Methodological proposals were thus fed with inputs from this first application task, in addition to inputs from the review exercise.

While the participatory approach seems to be fruitful in terms of contributions to the PhD, it is actually difficult to differentiate which elements came from the participatory exercise, and which elements would have emerged without the exercise, or even which ideas we had from the beginning. Obviously, this research did not start on a greenfield and I had ideas and beliefs about sustainability, about Belgian food systems and their sustainability, especially alternative ones, before starting this PhD.

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<sup>69</sup> Other C&I used in other assessment tools were also considered, but as a complementary material at the beginning of the process, and it was then confronted to inputs from the participatory process (cf. Chapter 5, 3.1 for more details)

This kind of questioning about the researcher's positioning and his or her objectivity/subjectivity to the research object is likely to be common to every researcher. But the inclusion in my methodology of the participatory process to select assessment C&I which I co-conducted with other academic researchers, and to which I thus contributed, brings additional questions and dilemmas that pursued my PhD: How far can a researcher put his/her ideas forward in such a research work? Am I legitimate to do that? What is the limit for a researcher to put personal views in a research work?

Retrospectively, the participatory process which we conducted within the COSY Food project was a kind of safeguard for me to put forward my ideas directly. I wished ideas from actors from alternative chains (as I, as a final consumer) to be put forward and to be heard. But at the same time, I participated in that process, and in the end, I broadly agreed with what came in. Following this, other kinds of questioning or regrets came in: did I/we influence it too much? Academic researchers were there to organize the process, but did we intervene too much into the process, with hard knowledge or our values? Should I/we had to withdraw from the participatory process? Or should I/we had to contribute to it differently?

### ***3.2 On the three proposals and related research questions***

**The proposal to select assessment C&I in a participatory manner** faces two main limits. If we consider that assessment criteria should be defined through a participatory approach involving actors of assessed chains, our framework cannot be applied to globalized chains or to processes occurring outside Belgium. Also, a participatory process such as the one we could implement is hardly applicable to any contexts (particularly of dispersed product chains) without support such as the dedicated funding that we received.

Thus, the main problem with the participatory process as we have done it (within a given geographical area) is that it results in a *contextualized* assessment tool. Contextualized assessments can give rise to more relevant and more significant assessment criteria and indicators for the given context, let it be a sector or a geographical area. Initially, we wanted to configure a specific assessment framework because there was a doubt over the adequacy of existing frameworks, especially the Guidelines for S-LCA, to assess Belgian alternative food chains.

The starting point of the PhD was indeed the Guidelines and its list of subcategories. At that time, the Guidelines were pointed at and criticized for several reasons (cf. introduction, 3.2). We turned our attention towards the fact that some subcategories (e.g. child or forced labor) were deemed not relevant for a Western context and the list would not be able to reflect the AFNs specificities. The configuration of an alternative framework through a participatory approach conducted in a Belgian context for the specific sector of food was seen as a way to confirm/infirm the relevance of the Guidelines list. Behind this, the main questioning regarded the possible universality of assessment criteria, or sustainability values and principles.

Over time, this questioning left others to emerge. When confronting the list of subcategories with our configured list of assessment criteria, we observed what we consider as shortcomings (e.g. the absence of mention to the share or distribution of value between value chain actors), but also the presence of a number of elements also highlighted through the participatory process, but that are barely included by practitioners (e.g. subcategories linked to relations between value chain actors, such as supplier relationship). Thus, we started questioning the absence of elements (rather than the adequacy of some elements) and the use that was made of the Guidelines' list (rather than the Guidelines list itself).

Also, when reviewing S-LCA studies, one of the critics raised over type I S-LCA approaches (and thus the application of the Guidelines list of subcategories), i.e. the mere reporting of issues, became clearer. To the critic over the lack of assessment of impacts experienced by people in type I S-LCA, we could add another critic: poor performances in supply chains are denounced or singled out, without looking for reasons or responsibilities for those poor performances, often located at the supplier side. One reason for that was that even when the right indicators are assessed, no link is made between them, and indicators are assessed separately.

Thus my questioning went from: “Do we have to configure contextualized lists of assessment criteria for S-LCA or does a universal definition of sustainability exist?” to “What should be assessed in S-LCA and how should it be assessed, so that assessments can help understand poor performances in supply chains and identify improvement levers?”.

**To reply to the second part of the question**, we put forward the proposal of including impact pathways targeting the root causes of problems in supply chains, and thus including explanatory variables or variables with a mere instrumental value in the analysis, and as such. This proposal is in line with the push for integrated LCSAs (analysis), i.e. where potential interrelations between system elements are considered (Onat et al. 2017; Sala, Farioli, and Zamagni 2012) (cf. 2.1 of this conclusion) and more generally for integrated assessments, which are “all the approaches that try to handle the information from individual indicators in a comprehensive manner, by considering interrelations and interdependencies among them, accounting for the different importance that they might have, and adopting different degrees of aggregation” (Cinelli, Coles, and Kirwan 2014).

When looking back to our work, the application of this specific proposal is the one that carries more *weaknesses*. The small samples of our applications are an important shortcoming of our work: S-LCA is a data- and resource-demanding tool and we had to limit our assessment to small samples. Also, there is a gap between what was foreseen and what we actually did: from the investigation of the link between chain governance, transaction modalities and income and employment conditions at the level of value chain actors, we finally sought to identify and interpret relationships between all assessed variables. And, from the application, it is not clear in the end what we considered as explanatory and explained variables. Starting from a deductive method (checking the validity of an assumption with empirical data), we finally conducted the assessment with an inductive method (drawing explanation and generalization from empirical data). This tends to show that there was a lack of pre-defined method for this part of the application.

All this led to a qualitative interpretation of the links between indicators and sustainability dimensions, that does not allow to confirm causal relationships, but solely to investigate such relationships. There is a need for further research, involving larger samples, and a well-defined methodology to validate our main assumption that chain governance and transaction modalities matter for socioeconomic conditions of workers. For this to happen, it is likely that the number of assessed indicators has to be reduced, so that it remains feasible.

**To reply to the first part of the question**, we put forward the proposal of including chain governance and economic aspects in the analysis, in order also to investigate whether those elements can be considered as roots causes of main social and socioeconomic problems in product chains. Behind this proposal, lies the strong belief, (that also appeared from the participatory process defining sustainable food systems), that there is a need to rethink how value is created (how prices are set) and shared (between value chain actors and within companies) to improve socioeconomic conditions of workers. A

potential key lever for a fairer distribution of value is the rebalancing of power relationships within chains and within enterprises.

An important and related question is about how to favor such a change. Which actions can be taken? While experiencing alternative forms of chain governance, the assessed AFNs encounter a number of social sustainability issues. We identified problems and their potential sources, some recommendations emerge from the conducted analysis but we have to admit that our applications fall short of providing actionable solutions. We would have liked to highlight or to put forward more consolidated and precise recommendations.

One main learning seems to be that policy actions should be implemented at the level of the regime (and not only at the level of the alternatives), for the whole regime to transform and to improve its social sustainability performance but also for AFNs to reach objectives at the level of their ambitions. There is also a need for a change in consumer mindset, and to a reorientation of consumption towards less quantity and more quality, at various levels.

Contrary to one of the critics raised over some of the Guidelines subcategories (Baumann et al. 2013), stating that some are too ideological and that health should “be in focus in S-LCA” since it is “the most intrinsic social value of all”, I think that more ideas, more ideology should be integrated in S-LCA. Economics and sociology are scientific fields where ideas are present, with various schools of thoughts spurring on both disciplines. If we want to integrate social sciences in S-LCA, we have to accept ideological positioning and some amount of subjectivity.

The focus we put on chain governance, economic and socioeconomic issues through the Global commodity chain lens has also drawbacks. We disregarded other issues, such value sharing within companies (the focus was on value sharing between companies) and also health issues (for workers or consumers), which can be linked to economic aspects, but not only, with health impacts stemming from exposures to substances or to certain working conditions. We also disregarded broader societal issues and issues linked to local communities. Those issues are important as well, and our framework does not seek to be comprehensive, but to contribute to the growing body of research striving to make S-LCA a useful and relevant tool.

#### 4. Outlook for future research

Finally, we summarize in this section the main outlooks for further research that we identified. **The first one** that relates to the last identified limit (cf. 2.1.4) is to carry out more applications investigating the relationship between social performances of companies regarding their workers and chain governance and transactions modalities, preferably on larger samples than ours, and also on mainstream chains. In this regard, we would recommend to focus on very specific indicators, since it does not seem feasible to look at several indicators on a large sample. The research work conducted by (Locke 2013) on globalized mainstream chains is very inspiring in this regard, though it does not use S-LCA.

While the link between environmental impacts and economic aspects has been investigated by Clift and al. (Jackson and Clift 1998; Clift 2003; Clift and Wright 2000; Clift, Sim, and Sinclair 2013), we propose as a **second future research area** to investigate the link between social and economic aspects within product chains. Clift et al. showed a trade-off between the distribution of environmental impacts between life cycle phases and the distribution of added value for a number of products: life cycle phases with high environmental impacts receive low added value (e.g. resource extraction), and those with low impacts receive high added value (e.g. assembly and retailing). Clift et al. argue for a better added value distribution among value chain actors:

*“Applying the principle of Environmental Justice which is central to sustainability (see above), disproportionate environmental impact in part of a supply chain indicates lack of equity and therefore unsustainability in the supply chain (Clift 2003), because an operator is either suffering local environmental damage without economic compensation or causing impacts, such as climate change, affecting others without compensating for the “externalities” (Clift, Sim, and Sinclair 2013).*

This approach seems quite convincing to argue for a fairer distribution of added value between chains actors for the sustainability of products to be improved, and for LCSA to adopt an integrated or nested approach. Regarding social impacts, some work has already been initiated by (Sim 2006; Bouzid and Padilla 2014). We identify a promising research area with the use of monetarized social impacts with preventative costs or Distance to sustainability approach (Croes and Vermeulen 2015), that could be compared to the distribution of added value per labour unit between value chain actors.

Also, we see as a **third promising research area** the development of indicators corresponding to aspects which have been raised through the participatory process but to which we could not pay sufficient attention. While we focused in this PhD on how to assess aspects linked to inter-firms governance, it could be worth investigating how to assess i) intra-firms governance (e.g. participation of workers in decision making processes) and intra-firms distribution of value (between capital and labour, between workers), ii) labor intensiveness of processes, iii) geographical scale of trade/relocation of trade (i.e. the extent to which a product can be considered as a local product) and iv) compliance to tax return and contribution to public expenses through tax payment and finally v) whether the sale price reflects all social (and environmental) costs (called the true price or Ecosocialcost (Croes and Vermeulen 2015)). Those are almost all quantitative indicators, additive for some of them, covering positive aspects for some others, that could also provide useful information on product chains, as those were identified as linked to product (social) sustainability by the participatory process.

**The fourth one** is the investigation through S-LCA case studies of other impact pathways based on other theories in social sciences that seek to explain main socioeconomic and social problems relating to product life cycles. In this regard, (Kühnen and Hahn 2017, 1554) have identified several theories “to provide future researchers with an orientation and thus contribute to the advancement of the field.”

# REFERENCES

- 11.11.11, Broederlijk Delen, Entraide et Fraternité, FIAN, Justice & Paix, CGSLB, AchACT, et al. 2019. "Entreprises et Droits humains. La Belgique doit concrétiser son engagement." Press release. <https://www.cncd.be/La-Belgique-doit-concretiser-son>.
- Adda, J. 2012. *La mondialisation de l'économie: de la genèse à la crise*. Huitième édition revue et augmentée. Paris: La découverte.
- AFOCG. 2017. "Résultats de Gestion 2017 - Issus Des Comptabilités de l'AFOCG." Paris, France: Association de gestion et de comptabilité.
- Andrews, Evan, Pascal Lesage, Catherine Benoît, Julie Parent, Gregory Norris, and Jean-Pierre Revéret. 2009. "Life Cycle Attribute Assessment." *Journal of Industrial Ecology* 13 (4): 565–78. <https://doi.org/10.1111/j.1530-9290.2009.00142.x>.
- Andrews, Evan, Gregory Norris, Pascal Lesage, Julie Parent, Catherine Benoit, and Jean-Pierre Reveret. 2009. "Life Cycle Attribute Assessment Case Study of Quebec Greenhouse Tomatoes."
- Arcese, Gabriella, Maria Claudia Lucchetti, and Ilaria Massa. 2017. "Modeling Social Life Cycle Assessment Framework for the Italian Wine Sector." *Journal of Cleaner Production*, Towards eco-efficient agriculture and food systems: selected papers addressing the global challenges for food systems, including those presented at the Conference "LCA for Feeding the planet and energy for life" (6-8 October 2015, Stresa & Milan Expo, Italy), 140, Part 2 (January): 1027–36. <https://doi.org/10.1016/j.jclepro.2016.06.137>.
- Arcese, Gabriella, Maria Claudia Lucchetti, Ilaria Massa, and Clara Valente. 2016. "State of the Art in S-LCA: Integrating Literature Review and Automatic Text Analysis." *The International Journal of Life Cycle Assessment*, March, 1–12. <https://doi.org/10.1007/s11367-016-1082-0>.
- Arvidsson, Rickard, Henrikke Baumann, and Jutta Hildenbrand. 2014. "On the Scientific Justification of the Use of Working Hours, Child Labour and Property Rights in Social Life Cycle Assessment: Three Topical Reviews." *The International Journal of Life Cycle Assessment* 20 (2): 161–73. <https://doi.org/10.1007/s11367-014-0821-3>.
- Arvidsson, Rickard, Jutta Hildenbrand, Henrikke Baumann, K. M. Nazmul Islam, and Rasmus Parsmo. 2016. "A Method for Human Health Impact Assessment in Social LCA: Lessons from Three Case Studies." *The International Journal of Life Cycle Assessment*, April, 1–10. <https://doi.org/10.1007/s11367-016-1116-7>.
- BADER, Claire. 2018. "Bio : que valent les produits des marques distributeurs ?" Capital.fr. June 1, 2018. <https://www.capital.fr/entreprises-marches/bio-que-valent-les-produits-des-marques-distributeurs-1290743>.
- Bair, Jennifer. 2005. "Global Capitalism and Commodity Chains: Looking Back, Going Forward." *Competition & Change* 9 (2): 153–80. <https://doi.org/10.1179/102452905X45382>.
- BAL, and EMB. 2019. "Was Kostet Die Erzeugung von Biomilch?" Brussels, Belgium: European Milk Board (EMB). [http://www.europeanmilkboard.org/fileadmin/Dokumente/Milk\\_Production\\_Costs/Updates\\_DE/BIO/Broschuere\\_Kostenrechnung\\_Bio-Milch\\_DE.pdf](http://www.europeanmilkboard.org/fileadmin/Dokumente/Milk_Production_Costs/Updates_DE/BIO/Broschuere_Kostenrechnung_Bio-Milch_DE.pdf).
- BAL/EMB. 2014. "Combien Coûte La Production de Lait ? - 2e Partie : Les Coûts de La Production Laitière En France Édition 1: De 2002 à 2013." Brussels, Belgium: European Milk Board. <http://www.europeanmilkboard.org/milk-production-costs.html>.
- . 2016. "What Is the Cost of Producing Milk? Calculation of Milk Production Costs Based on the Farm Accountancy Data Network (FADN) in Belgium, Denmark, France, Germany, Netherlands." Brussels, Belgium: European Milk Board (EMB). [http://www.europeanmilkboard.org/fileadmin/Subsite/Broschuere\\_Kostenrechnung\\_Milch\\_2016\\_Neuauflage\\_FINAL\\_EN.pdf](http://www.europeanmilkboard.org/fileadmin/Subsite/Broschuere_Kostenrechnung_Milch_2016_Neuauflage_FINAL_EN.pdf).
- . 2017. "Combien Coûte La Production de Lait? - 4ème Partie, 2ème Édition: Coût de La Production Laitière En Belgique, Pour l'année 2016." Gleichen, Allemagne: European Milk Board (EMB).

- [http://www.europeanmilkboard.org/fileadmin/Dokumente/Milk\\_Production\\_Costs/Updates\\_BE/Etude\\_BEMAJ\\_2016\\_FR.pdf](http://www.europeanmilkboard.org/fileadmin/Dokumente/Milk_Production_Costs/Updates_BE/Etude_BEMAJ_2016_FR.pdf).
- Barrett, Paul M., and Dorothée Baumann-Pauly. 2019. "Made in Ethiopia: Challenges in the Garment Industry's New Frontier." New York, USA: New York University Stern Center for Business and Human Rights. [https://issuu.com/nyusterncenterforbusinessandhumanri/docs/nyu\\_ethiopia\\_final\\_online/1](https://issuu.com/nyusterncenterforbusinessandhumanri/docs/nyu_ethiopia_final_online/1).
- Barrientos, Stephanie, Gary Gereffi, and Arianna Rossi. 2011. "Economic and Social Upgrading in Global Production Networks: A New Paradigm for a Changing World." *International Labour Review* 150 (3–4): 319–40. <https://doi.org/10.1111/j.1564-913X.2011.00119.x>.
- Barrientos, Stephanie, and Sally Smith. 2007. "Do Workers Benefit from Ethical Trade? Assessing Codes of Labour Practice in Global Production Systems." *Third World Quarterly* 28 (4): 713–29. <https://doi.org/10.1080/01436590701336580>.
- BASIC. 2019. "Rémunération Des Producteurs et Transition Agroécologique : Quelles Contributions Du Commerce Équitable Origine France ?" Commerce Equitable France, Biocoop, Ethiquable, Ecocert, Bio Partenaire, Basi. <https://lebasic.com/remuneration-des-producteurs-et-transition-agroecologique-queelles-contributions-du-commerce-equitable-origine-france/>.
- Baudry, Bernard, and Virgile Chassagnon. 2014. *Les Théories Économiques de l'entreprise*. Repères N°636. Éditions la découverte. [http://www.editionsladecouverte.fr/catalogue/index-Les\\_th\\_ories\\_\\_\\_\\_conomiques\\_de\\_l\\_entreprise-9782707176790.html](http://www.editionsladecouverte.fr/catalogue/index-Les_th_ories____conomiques_de_l_entreprise-9782707176790.html).
- Baumann, Henrikke, Rickard Arvidsson, Hui Tong, and Ying Wang. 2013. "Does the Production of an Airbag Injure More People than the Airbag Saves in Traffic?" *Journal of Industrial Ecology* 17 (4): 517–27. <https://doi.org/10.1111/jiec.12016>.
- BCZ-CBL. 2017. "Le Rapport Laitier - Édition 2017." Brussels, Belgium: Confédération belge de l'industrie laitière. <https://bcz-cbl.be/fr/produits-laitiers-en-chiffres/rapport-laitier-2017/>.
- Behaghel, Luc. 2006. *Lire l'économétrie*. Collection Repères. Economie ; 460. Paris: La Découverte.
- Bell, Simon, and Stephen Morse. 2001. "Breaking through the Glass Ceiling: Who Really Cares about Sustainability Indicators?" *Local Environment* 6 (3): 291–309. <https://doi.org/10.1080/13549830120073284>.
- . 2004. "Experiences with Sustainability Indicators and Stakeholder Participation: A Case Study Relating to a 'Blue Plan' Project in Malta." *Sustainable Development* 12 (1): 1–14. <https://doi.org/10.1002/sd.225>.
- Benoît, Catherine, and Bernard Mazijn. 2009. "Guidelines for Social Life Cycle Assessment of Products." Paris: UNEP/SETAC.
- Benoît, Catherine, Gregory A. Norris, Sonia Valdivia, Andreas Ciroth, Asa Moberg, Ulrike Bos, Siddharth Prakash, Cassia Ugaya, and Tabea Beck. 2010. "The Guidelines for Social Life Cycle Assessment of Products: Just in Time!" *The International Journal of Life Cycle Assessment* 15 (2): 156–63. <https://doi.org/10.1007/s11367-009-0147-8>.
- Benoît, Catherine, Marzia Traverso, Sonia Valdivia, Gina Vickery-Niederman, Juliane Franze, Lina Azuero, Andreas Ciroth, Bernard Mazijn, and Deana Aulisio. 2013. "The Methodological Sheets for Subcategories in Social Life Cycle Assessment (S-LCA)." UNEP/SETAC.
- Benoit-Norris, Catherine, Deana Aulisio Cavan, and Gregory Norris. 2012. "Identifying Social Impacts in Product Supply Chains: Overview and Application of the Social Hotspot Database." *Sustainability* 4 (9): 1946–65. <https://doi.org/10.3390/su4091946>.
- BFTF. n.d. "Belgian Members." Belgian Fair Trade Federation. n.d. <http://www.bftf.be/en/belgian-actors-45/>.
- Bijttebier, Jo, Lies Debruyne, and Nicole Taragola. 2017. "Producentenorganisaties in de Melkveehouderij: Een Doorlichting." ILVO MEDEDELING 22. Merelbeke, Belgium: Instituut voor Landbouw-, Visserij- en Voedingsonderzoek (ILVO). [https://pure.ilvo.be/portal/files/6274252/Bijttebier\\_Rapport\\_Producentenorganisaties\\_in\\_de\\_melkveehouderij\\_Een\\_doorlichting.pdf](https://pure.ilvo.be/portal/files/6274252/Bijttebier_Rapport_Producentenorganisaties_in_de_melkveehouderij_Een_doorlichting.pdf).
- Bijttebier, Jo, and Wim Govaerts. 2016. "Wat Is de Kostprijs van Biologische Melk?" *Management&Techniek, Boerenbond*, May 27, 2016. <https://edepot.wur.nl/385019>.



- BioForum Vlaanderen. 2018. "De biologische zuivelketen in beeld." *Bio Actief*, March 2018. [https://issuu.com/bioforumvlaanderen/docs/bioactief-39\\_issuu](https://issuu.com/bioforumvlaanderen/docs/bioactief-39_issuu).
- Biolait. 2020. "Biolait Annonce Son Prix Du Lait 2019 (TPC) et Renforce Ses Aides Financières." *Biolait* (blog). January 28, 2020. <https://www.biolait.eu/biolait-annonce-son-prix-du-lait-2019-tpc-et-renforce-ses-aides-financieres/>.
- . n.d. "Qui Sommes-Nous." Biolait. Accessed April 27, 2020. <https://www.biolait.eu/qui-sommes-nous/#nos-objectifs>.
- Bioland e.V. n.d. "Informationen Zum Bio-Milchpreis." Biomilchpreise. Accessed April 13, 2020. <http://www.biomilchpreise.de/>.
- Biomilk.be. n.d. "Welkom." Biomilk.be. Accessed February 16, 2020. <https://www.biomilk.be/>.
- Biowallonie. 2018. "Les Chiffres Du Bio 2017." Namur, Belgique: Biowallonie. <https://www.biowallonie.com/chiffres-bio-2017/>.
- Bocoum, Ibrahima, Catherine Macombe, and Jean-Pierre Revéret. 2015. "Anticipating Impacts on Health Based on Changes in Income Inequality Caused by Life Cycles." *The International Journal of Life Cycle Assessment* 20 (3): 405–17. <https://doi.org/10.1007/s11367-014-0835-x>.
- Bonacina De Auraujo, Jaylton, and Cassia Maria Lie Ugaya. 2018. "Development of S-LCIA Models: A Review of Multivariate Data Analysis Methods." In *Pre-Proceedings*. Fruitrop Thema. Pescara, Italy: CIRAD.
- Bonnaïfous-Boucher, Maria, and Jacob Dahl Rendtorff. 2014. *La theorie des parties prenantes*. La découverte. Repères. Paris, France. <https://www.cairn.info/la-theorie-des-parties-prenantes--9782707146533.htm>.
- Boulanger, P.-M., A.-L. Lefin, C. Ruwet, T. Bauler, A. Gerard, N. Prignot, L. Ootegem, and S. Spillemaeckers. 2011. "Towards Theoretically Sound and Democratically Legitimate Indicators of Wellbeing for Belgium - WELLBEBE." Brussels: Belgian Science Policy.
- Bouزيد, A., and M. Padilla. 2014. "Analysis of Social Performance of the Industrial Tomatoes Food Chain in Algeria." *New Medit* 13 (1): 60–65.
- Brent, Alan, and Carin Labuschagne. 2006. "Social Indicators for Sustainable Project and Technology Life Cycle Management in the Process Industry (13 Pp + 4)." *The International Journal of Life Cycle Assessment* 11 (1): 3–15. <https://doi.org/10.1065/lca2006.01.233>.
- Brown, Cheryl, and Stacy Miller. 2008. "The Impacts of Local Markets: A Review of Research on Farmers Markets and Community Supported Agriculture (CSA)." *American Journal of Agricultural Economics* 90 (5): 1296–1302.
- Capron, Michel, and Françoise Quairel-Lanoizelée. 2007. *La responsabilité sociale d'entreprise*. Collection Repères. Série Gestion 477. Paris: Découverte.
- . 2015. *L'entreprise dans la société: une question politique*. La découverte. Grands repères-Manuels. Paris, France. <https://hal-upec-upem.archives-ouvertes.fr/hal-01252569>.
- CBL. 2016. "Rapport Annuel 2016." Confédération belge de l'industrie laitière (CBL).
- Chen, Wenhao, and Nicholas M. Holden. 2016. "Social Life Cycle Assessment of Average Irish Dairy Farm." *The International Journal of Life Cycle Assessment*, December, 1–14. <https://doi.org/10.1007/s11367-016-1250-2>.
- Chhipi-Shrestha, Gyan Kumar, Kasun Hewage, and Rehan Sadiq. 2014. "'Socializing' Sustainability: A Critical Review on Current Development Status of Social Life Cycle Impact Assessment Method." *Clean Technologies and Environmental Policy* 17 (3): 579–96. <https://doi.org/10.1007/s10098-014-0841-5>.
- Chiffolleau, Yuna. 2019. *Les circuits courts alimentaires, Entre marché et innovation sociale*. Sociologie économique. Toulouse: ERES. <https://doi.org/10.3917/eres.chiff.2019.01>.
- CIDD. 2017. "Plan d'action National Entreprises et Droits de l'Homme." Bruxelles, Belgique: Commission Interdépartementale pour le Développement Durable. [https://www.sdgs.be/sites/default/files/publication/attachments/plan\\_daction\\_national\\_entreprises\\_et\\_droits\\_de\\_lhomme\\_2017.compressed.pdf](https://www.sdgs.be/sites/default/files/publication/attachments/plan_daction_national_entreprises_et_droits_de_lhomme_2017.compressed.pdf).

- Cinelli, Marco, Stuart R. Coles, and Kerry Kirwan. 2014. "Analysis of the Potentials of Multi Criteria Decision Analysis Methods to Conduct Sustainability Assessment." *Ecological Indicators* 46 (November): 138–48. <https://doi.org/10.1016/j.ecolind.2014.06.011>.
- CIRAIG. 2013. "International Seminar on Social LCA -May 6 and 7, 2013 in Montreal." 2013. [http://www.ciraig.org/en/evenement/seminaire\\_ACVs/acv-sociale\\_e.php](http://www.ciraig.org/en/evenement/seminaire_ACVs/acv-sociale_e.php).
- Ciroth, Andreas, and Franziska Eisfeldt. 2016. "PSILCA - A Product Social Impact Life Cycle Assessment Database."
- Clean clothes campaign. 2009. "Cashing In - Giant Retailers, Purchasing Practices, and Working Conditions in the Garment Industry." File. Amsterdam, The Netherlands: Clean clothes campaign. <https://cleanclothes.org/resources/publications/cashing-in.pdf>.
- Clift, Roland. 2003. "Metrics for Supply Chain Sustainability." *Clean Technologies and Environmental Policy* 5 (3–4): 240–47. <http://dx.doi.org/10.1007/s10098-003-0220-0>.
- Clift, Roland, Sarah Sim, and Philip Sinclair. 2013. "Sustainable Consumption and Production: Quality, Luxury and Supply Chain Equity." In *Treatise on Sustainability Science and Engineering*, edited by I. S. Jawahir, S. K. Sikdar, and Y. Huang, 291–309. Springer Netherlands. [https://doi.org/10.1007/978-94-007-6229-9\\_17](https://doi.org/10.1007/978-94-007-6229-9_17).
- Clift, Roland, and Lucy Wright. 2000. "Relationships Between Environmental Impacts and Added Value Along the Supply Chain." *Technological Forecasting and Social Change* 65 (3): 281–95. [https://doi.org/10.1016/S0040-1625\(99\)00055-4](https://doi.org/10.1016/S0040-1625(99)00055-4).
- Coe, Neil M., Peter Dicken, and Martin Hess. 2008. "Global Production Networks: Realizing the Potential." *Journal of Economic Geography* 8 (3): 271–95. <https://doi.org/10.1093/jeg/lbn002>.
- Collège des producteurs. 2016. "Se Rapprocher Du Consommateur: Une Opportunité Pour Des Prix plus Justes En Agriculture?" 2016. <https://www.collegedesproducteurs.be/site/index.php/presse/399-article-se-rapprocher-du-consommateur-une-opportunite-pour-des-prix-plus-justes-en-agriculture>.
- . n.d. "Prix juste Producteur – Le label pour un prix juste aux producteurs." Prix juste producteur. Accessed March 1, 2020. <https://prixjuste.be/>.
- Commerce équitable France. n.d. "Commerce Équitable 'Origine France.'" Commerce Équitable France. Accessed April 24, 2020a. <https://www.commerceequitable.org/notre-collectif/commerce-equitable-origine-france/>.
- . n.d. "Définitions." Commerce Équitable France. Accessed April 20, 2020b. <https://www.commerceequitable.org/le-commerce-equitable/definitions/>.
- "Community-Supported Agriculture." 2019. Wikipedia. January 10, 2019. [https://en.wikipedia.org/w/index.php?title=Community-supported\\_agriculture&oldid=877797688](https://en.wikipedia.org/w/index.php?title=Community-supported_agriculture&oldid=877797688).
- Croes, Pim R., and Walter J. V. Vermeulen. 2015. "Comprehensive Life Cycle Assessment by Transferring of Preventative Costs in the Supply Chain of Products. A First Draft of the Oiconomy System." *Journal of Cleaner Production* 102 (September): 177–87. <https://doi.org/10.1016/j.jclepro.2015.04.040>.
- De Luca, Anna Irene, Nathalie Iofrida, Alfio Strano, Giacomo Falcone, and Giovanni Gulisano. 2015a. "Social Life Cycle Assessment and Participatory Approaches: A Methodological Proposal Applied to Citrus Farming in Southern Italy." *Integrated Environmental Assessment and Management* 11 (3): 383–96. <https://doi.org/10.1002/ieam.1611>.
- . 2015b. "Social Life Cycle Assessment and Participatory Approaches: A Methodological Proposal Applied to Citrus Farming in Southern Italy." *Integrated Environmental Assessment and Management* 11 (3): 383–96. <https://doi.org/10.1002/ieam.1611>.
- De Schutter, Olivier. 2010. "Addressing Concentration in Food Supply Chains The Role of Competition Law in Tackling the Abuse of Buyer Power." Geneva, Switzerland: United Nations Human Rights Council. [http://www.ohchr.org/Documents/Issues/Food/BN3\\_SRRTF\\_Competition\\_ENGLISH.pdf](http://www.ohchr.org/Documents/Issues/Food/BN3_SRRTF_Competition_ENGLISH.pdf).
- De Stefano, Valerio. 2016. "The Rise of the 'Just-in-Time Workforce': On-Demand Work, Crowdsourcing and Labour Protection in the 'Gig-Economy.'" Working paper. Geneva, Switzerland: International

- Labour Organization. [http://www.ilo.org/travail/whatwedo/publications/WCMS\\_443267/lang-en/index.htm](http://www.ilo.org/travail/whatwedo/publications/WCMS_443267/lang-en/index.htm).
- Dedieu, Marie-Sophie, Alice Lorge, Olivier Louveau, and Vincent Marcus. 2017. "Les Exploitations En Agriculture Biologique : Quelles Performances Économiques ?" *Insee Références*, 2017. <https://www.insee.fr/fr/statistiques/3280932?sommaire=3280952>.
- Delcour, Alice, Virginie Decruyenaere, Jean-Pierre Goffart, Florence Van Stappen, Astrid Loriers, Philippe Burny, Fabienne Rabier, and Didier Stilmant. 2014. "ASCV Comparative Des Filières Céréalières En Wallonie (Belgique)." In *Social LCA in Progress - Pre-Proceedings*. Montpellier. [http://social-lca.cirad.fr/content/download/4269/32028/version/1/file/Thema+2+-+Sess3-5+Delcour+et+al.+2014\\_4thSocSem\\_SLCA\\_Montpellier.pdf](http://social-lca.cirad.fr/content/download/4269/32028/version/1/file/Thema+2+-+Sess3-5+Delcour+et+al.+2014_4thSocSem_SLCA_Montpellier.pdf).
- Delcour, Alice, Florence Van Stappen, P. Burny, J.-P. Goffart, and D. Stilmant. 2015. "Assessment and contributions of different social life cycle assessments performed in the agribusiness sector." *Biotechnology, Agronomy and Society and Environment* 19 (4): 402–14.
- Delhaize. 2018. "Delhaize entame une collaboration durable avec biomilk.be pour des produits laitiers bio 100% belges." [https://www.delhaize.be/fr-be/press\\_overview:Biomilk](https://www.delhaize.be/fr-be/press_overview:Biomilk).
- Deloitte. 2016. "National Beef Sustainability Assessment - Environmental and Social Life Cycle Assessments." Calgary, Canada: Canadian Roundtable for Sustainable Beef.
- Dessard, Marine. 2016. "Confrontation Des Deux Méthodes d'analyse Sociale Du Cycle de Vie et Caractérisation Des Apports Sociaux d'un Système En Circuit Court." Mémoire de master, Université Libre de Bruxelles. [http://mem-envi.ulb.ac.be/Memoires\\_en\\_pdf/MFE\\_15\\_16/MFE\\_Dessard\\_15\\_16.pdf](http://mem-envi.ulb.ac.be/Memoires_en_pdf/MFE_15_16/MFE_Dessard_15_16.pdf).
- Devreese, Johan. 2016. "De Markt Voorbiologische Zuivel." Presented at the Studienamiddag Provincie West-Vlaanderen Sterke vraag naar biologische zuivel Wat zijn de kansen voor uw bedrijf ?, Inagro, January 26. <https://www.inagro.be/Artikel/guid/1645>.
- Di Cesare, Silvia. 2016. "Farmworkers' Pesticides Exposition Assessment: The Wesseling Pathway." Presented at the « Ecole-chercheurs » on Social Life Cycle Assessment Application to agriculture and agrifood sectors, Sète, France. <http://social-lca.cirad.fr/ecole-chercheurs-2016>.
- Di Cesare, Silvia, Catherine Macombe, Luigia Petti, and Denis Loeillet. 2016. "Necessity of Including the Evaluation of Pesticides Impacts on Farmworkers Health in Social LCA." In *Book of Abstracts SLCA 2016*. Harvard, Cambridge, USA. [https://slca2016.exordo.com/files/messages/441/ExOrdo-slca2016-Version\\_4-2.pdf](https://slca2016.exordo.com/files/messages/441/ExOrdo-slca2016-Version_4-2.pdf).
- Di Cesare, Silvia, Federica Silveri, Serenella Sala, and Luigia Petti. 2016. "Positive Impacts in Social Life Cycle Assessment: State of the Art and the Way Forward." *The International Journal of Life Cycle Assessment*, September, 1–16. <https://doi.org/10.1007/s11367-016-1169-7>.
- Dreyer, Louise, Michael Hauschild, and Jens Schierbeck. 2005. "A Framework for Social Life Cycle Impact Assessment (10 Pp)." *The International Journal of Life Cycle Assessment* 11 (2): 88–97. <https://doi.org/10.1065/lca2005.08.223>.
- Duchesne, Coline. 2006. "Etat des lieux et analyse des problématiques rencontrées dans la filière du lait biologique en Wallonie." Master's thesis, Brussels, Belgium: Université Libre de Bruxelles. [http://mem-envi.ulb.ac.be/Memoires\\_en\\_pdf/MFE\\_05\\_06/MFE\\_Duchesne\\_05\\_06.pdf](http://mem-envi.ulb.ac.be/Memoires_en_pdf/MFE_05_06/MFE_Duchesne_05_06.pdf).
- Dumont, Antoinette. 2017. "Analyse systémique des conditions de travail et d'emploi dans la production de légumes pour le marché du frais en Région wallonne (Belgique), dans une perspective de transition agroécologique." Ph.D. Thesis, UCL - Université Catholique de Louvain. <https://dial.uclouvain.be/pr/boreal/object/boreal:192704>.
- EC. 2001. "Green Paper - Promoting a European Framework for Corporate Social Responsibility." COM/2001/0366 final. Brussels, Belgium: European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52001DC0366>.
- . 2006. "Implementing the Partnership for Growth and Jobs : Making Europe a Pole of Excellence on Corporate Social Responsibility." Communication from the Commission to the European Parliament, the Council and the European Economic and Social Committee COM/2006/0136 final. Brussels, Belgium: European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52006DC0136&from=EN>.

- . 2008. "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan." COM(2008) 397 final. Brussels, Belgium: European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008DC0397&from=EN>.
- . 2011. "A Renewed EU Strategy 2011-14 for Corporate Social Responsibility." COM/2011/0681 final. Brussels, Belgium: European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1571742672641&uri=CELEX:52011DC0681>.
- . 2013. "How Many People Work in Agriculture in the European Union? An Answer Based on Eurostat Data Sources." EU Agricultural Economics Briefs 8. Brussels, Belgium: European Commission. [https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/agri-economics-brief-08\\_en.pdf](https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/agri-economics-brief-08_en.pdf).
- . 2014. *Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 Amending Directive 2013/34/EU as Regards Disclosure of Non-Financial and Diversity Information by Certain Large Undertakings and Groups Text with EEA Relevance*. 330. Vol. OJ L. <http://data.europa.eu/eli/dir/2014/95/oj/eng>.
- . 2019. *Directive (EU) 2019/633 of the European Parliament and of the Council of 17 April 2019 on Unfair Trading Practices in Business-to-Business Relationships in the Agricultural and Food Supply Chain*. 111. Vol. OJ L. <http://data.europa.eu/eli/dir/2019/633/oj/eng>.
- ECCJ. 2019. "Evidence for Mandatory HRDD Legislation." Brussels, Belgium: European Coalition for Corporate Justice. <http://corporatejustice.org/eccj-publications/15144-evidence-for-mandatory-hrdd-legislation-updated-may-2019>.
- ECCJ, and Clean Clothes Campaign. 2019. "A Human Rights Review of the EU Non-Financial Reporting Directive." Brussels, Belgium: European Coalition for Corporate Justice. <http://corporatejustice.org/eccj-publications/14985-a-human-rights-review-of-the-eu-non-financial-reporting-directive>.
- Edwards, Ferne. 2016. "Alternative Food Networks." In *Encyclopedia of Food and Agricultural Ethics*, 1–7. Springer, Dordrecht. [https://doi.org/10.1007/978-94-007-6167-4\\_513-1](https://doi.org/10.1007/978-94-007-6167-4_513-1).
- Elkington, J. 1998. "Partnerships from Cannibals with Forks: The Triple Bottom Line of 21st-Century Business." *Environmental Quality Management* 8 (1): 37–51. <https://doi.org/10.1002/tqem.3310080106>.
- EMB. 2012. "Coopératives, Entre Mythe et Réalité." Hamm, Germany: European Milk Board. [http://www.europeanmilkboard.org/fileadmin/Dokumente/Positions\\_EMB/12-02\\_Positions/Cooperatives\\_FR.pdf](http://www.europeanmilkboard.org/fileadmin/Dokumente/Positions_EMB/12-02_Positions/Cooperatives_FR.pdf).
- . 2018. "Que Se Passe-t-Il Dans Le Secteur Laitier ? Press Release." Brussels, Belgium: European Milk Board. <http://www.europeanmilkboard.org/fr/special-content/actualites/news-details/article/whats-the-matter-with-the-dairy-sector.html?cHash=9712ee9764745ec07ad2b15f62382999>.
- . n.d. "Fair Milk." European Milk Board. Accessed April 20, 2020. <http://www.europeanmilkboard.org/en/special-content/fair-milk.html>.
- EP, and Council. 2017. *Regulation (EU) 2017/821 of the European Parliament and of the Council of 17 May 2017 Laying down Supply Chain Due Diligence Obligations for Union Importers of Tin, Tantalum and Tungsten, Their Ores, and Gold Originating from Conflict-Affected and High-Risk Areas*. OJ L. Vol. 130. <http://data.europa.eu/eli/reg/2017/821/oj/eng>.
- EU-OSHA. n. d. "Psychosocial Risks and Stress at Work - Safety and Health at Work." European Agency for Safety and Health at Work. n. d. <https://osha.europa.eu/en/themes/psychosocial-risks-and-stress>.
- Eurofound. 2014a. "Agriculture Sector: Working Conditions and Job Quality." EF/13/84/EN 11. Dublin, Ireland: Eurofound (European foundation for the improvement of living and working conditions). <https://www.eurofound.europa.eu/publications/information-sheet/2014/working-conditions/agriculture-sector-working-conditions-and-job-quality>.

- . 2014b. “Working Conditions and Job Quality: Comparing Sectors in Europe.” Dublin, Ireland: European foundation for the improvement of living and working conditions. <https://www.eurofound.europa.eu/fr/publications/report/2014/working-conditions/working-conditions-and-job-quality-comparing-sectors-in-europe-overview-report>.
- Eurostat. 2018. “In-Work Poverty in the EU.” Eurostat. March 16, 2018. <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20180316-1>.
- Fabre, Brice. 2011. “Le poids du logement dans le budget des ménages.” *Regards croisés sur l'économie* n° 9 (1): 33–35.
- Fair trade Belgium. 2017. “Facts & Figures.” Fairtrade Belgium. 2017. <https://www.fairtradebelgium.be/fr/facts-figures/>.
- FaireFrance. n.d. “Le lait FaireFrance vendu au prix juste !” *FaireFrance* (blog). Accessed April 28, 2020. <https://fairefrance.fr/media/le-lait-fairefrance-vendu-au-prix-juste/>.
- Fan, Yi, Ruqun Wu, Jiquan Chen, and Defne Apul. 2015. “A Review of Social Life Cycle Assessment Methodologies.” In *Social Life Cycle Assessment*, edited by Subramanian Senthilkannan Muthu, 1–23. Environmental Footprints and Eco-Design of Products and Processes. Springer Singapore. [https://doi.org/10.1007/978-981-287-296-8\\_1](https://doi.org/10.1007/978-981-287-296-8_1).
- FAO. 2017. “The Future of Food and Agriculture - Trends and Challenges.” Rome, Italy: Food and agriculture Organization (FAO). <http://www.fao.org/3/a-i6583e.pdf>.
- Feschet, P., N. Iofrida, A.I. De Luca, F. Silveri, and A. Strano. 2018. “What Are the Sustainability Principles Guiding Social Life Cycle Assessment Studies?” *International Journal of Sustainable Development* 21 (1–4): 36–53. <https://doi.org/10.1504/IJSD.2018.100824>.
- Feschet, Pauline. 2014. “Analyse Du Cycle de Vie Sociale. Pour Un Nouveau Cadre Conceptuel et Théorique.” PhD Thesis, Montpellier, France: Université de Montpellier 1. <http://www.biu-montpellier.fr/florabium/jsp/nnt.jsp?nnt=2014MON10003>.
- Feschet, Pauline, Catherine Macombe, Michel Garrabé, Denis Loeillet, Adolfo Rolo Saez, and François Benhmad. 2012. “Social Impact Assessment in LCA Using the Preston Pathway.” *The International Journal of Life Cycle Assessment* 18 (2): 490–503. <https://doi.org/10.1007/s11367-012-0490-z>.
- Feyereisen, Marlène, Pierre M. Stassart, and François Mélard. 2017. “Fair Trade Milk Initiative in Belgium: Bricolage as an Empowering Strategy for Change.” *Sociologia Ruralis* 57 (3): 297–315. <https://doi.org/10.1111/soru.12174>.
- Filippi, Maryline. 2016. “Rémunération en coopératives agricoles : les dessous du débat.” *RECMA* N° 341 (3): 119–25.
- Fontes, João. 2014. “Handbook for Product Social Impact Assessment.” PRé Sustainability. <http://product-social-impact-assessment.com/>.
- Forssell, Sini, and Leena Lankoski. 2014. “The Sustainability Promise of Alternative Food Networks: An Examination through ‘Alternative’ Characteristics.” *Agriculture and Human Values* 32 (1): 63–75. <https://doi.org/10.1007/s10460-014-9516-4>.
- FranceAgrimer. n.d. “Informations de Conjoncture.” FranceAgrimer. Accessed April 10, 2020. <https://www.franceagrimer.fr/Eclairer/Etudes-et-Analyses/Informations-de-conjoncture>.
- Fraser, Evan D. G., Andrew J. Dougill, Warren E. Mabee, Mark Reed, and Patrick McAlpine. 2006. “Bottom up and Top down: Analysis of Participatory Processes for Sustainability Indicator Identification as a Pathway to Community Empowerment and Sustainable Environmental Management.” *Journal of Environmental Management* 78 (2): 114–27. <https://doi.org/10.1016/j.jenvman.2005.04.009>.
- Frederick, Stacey. 2016. “Concept & Tools, Global Value Chains Initiative.” August 16, 2016. <https://globalvaluechains.org/concept-tools>.
- Freebairn, D.M., and C.A. King. 2003. “Reflections on Collectively Working toward Sustainability: Indicators for Indicators!” *Australian Journal of Experimental Agriculture* 43 (3): 223–38. <https://doi.org/10.1071/EA00195>.
- Friedman, Milton. 1970. “The Social Responsibility of Business Is to Increase Its Profits.” *The New York Times Magazine*, September 13, 1970.

- Gaasbeek, Anne, and Ellen Meijer. 2013. "Handbook on a Novel Methodology for the PROpective SUSTainability Impact Assessment of New TEchnologies (PROSUITE)." *PROSUITE*.
- Galt, Ryan E. 2013. "The Moral Economy Is a Double-Edged Sword: Explaining Farmers' Earnings and Self-Exploitation in Community-Supported Agriculture." *Economic Geography* 89 (4): 341–65. <https://doi.org/10.1111/ecge.12015>.
- Garrabé, Michel, and Pauline Feschet. 2013. "A Specific Case: Capacities Social LCA." In *Social LCAs - Socio-Economic Effects in Value Chains*. Fruitrop Thema. Montpellier: CIRAD/IRSTEA.
- Gauthier, Caroline. 2005. "Measuring Corporate Social and Environmental Performance: The Extended Life-Cycle Assessment." *Journal of Business Ethics* 59 (1/2): 199–206.
- Gereffi, Gary. 1994. "The Organization of Buyer-Driven Global Commodity Chains: How U.S. Retailers Shape Overseas Production Networks." In *Commodity Chains and Global Capitalism*, Praeger. US: Gary Gereffi and Miguel Korzeniewicz. <https://globalvaluechains.org/publication/organization-buyer-driven-global-commodity-chains-how-us-retailers-shape-overseas>.
- Gereffi, Gary, and Karina Fernandez-Stark. 2016. "Global Value Chain Analysis: A Primer." Duke University, Global Value Chains (GVC) Center. <https://globalvaluechains.org/publication/global-value-chain-analysis-primer-2nd-edition>.
- Gereffi, Gary, John Humphrey, and Timothy Sturgeon. 2005. "The Governance of Global Value Chains." *Review of International Political Economy* 12 (1): 78–104. <https://doi.org/10.1080/09692290500049805>.
- Gereffi, Gary, and Miguel Korzeniewicz. 1990. "Commodity Chains and Footwear Exports in the Semiperiphery." In *Semiperipheral States in the World Economy*, Greenwood Press, 45–68. William Martin.
- Gibbon, Peter, Jennifer Bair, and Stefano Ponte. 2008. "Governing Global Value Chains: An Introduction." *Economy and Society* 37 (3): 315–38. <https://doi.org/10.1080/03085140802172656>.
- Girard, Laurence. 2017. "L'UFC-Que choisir dénonce les «marges exorbitantes» de la grande distribution sur les fruits et légumes bio." *Le Monde.fr*, August 29, 2017. [http://www.lemonde.fr/economie/article/2017/08/29/la-grande-distribution-fait-ses-choux-gras-du-bio\\_5177856\\_3234.html](http://www.lemonde.fr/economie/article/2017/08/29/la-grande-distribution-fait-ses-choux-gras-du-bio_5177856_3234.html).
- Giuliano, Romina, and Claire Dupont. 2013. "Analyse du label social belge et d'un code de conduite dans la lutte contre le travail des enfants." *Management Avenir* N° 66 (8): 182–200.
- Glorieux, Mikaël. 2009. "Le label social belge : une initiative à valeur d'exemple ?" *Reflets et perspectives de la vie économique* Tome XLVIII (4): 99–107.
- Goedkoop, M.J., Indrane, D., and de Beer, I.M. 2018. "Handbook for Product Social Impact Assessment." Amersfoort. <https://product-social-impact-assessment.com/wp-content/uploads/2018/09/Handbook-for-Product-Social-Impact-Assessment-2018.pdf>.
- Gorton, William, A. 2019. "The Philosophy of Social Science." In *Internet Encyclopedia of Philosophy*. <https://www.iep.utm.edu/soc-sci/>.
- Greenhalgh, Trisha, Claire Jackson, Sara Shaw, and Tina Janamian. 2016. "Achieving Research Impact Through Co-Creation in Community-Based Health Services: Literature Review and Case Study." *The Milbank Quarterly* 94 (2): 392–429. <https://doi.org/10.1111/1468-0009.12197>.
- Grubert, Emily. 2016. "Rigor in Social Life Cycle Assessment: Improving the Scientific Grounding of SLCA." *The International Journal of Life Cycle Assessment*, April, 1–11. <https://doi.org/10.1007/s11367-016-1117-6>.
- Guillaume, Mary, and Patrick Houben. 2017. "TresoGest : Un Outil de Gestion Financière Qui s'inscrit Dans Une Démarche Collective et Participative." *Itinéraire Bio*, 2017.
- Guinée, Jeroen. 2016. "Life Cycle Sustainability Assessment: What Is It and What Are Its Challenges?" In *Taking Stock of Industrial Ecology*, edited by Roland Clift and Angela Druckman, 45–68. Springer International Publishing. [https://doi.org/10.1007/978-3-319-20571-7\\_3](https://doi.org/10.1007/978-3-319-20571-7_3).
- Haaster, Berthe van, Andreas Ciroth, João Fontes, Richard Wood, and Andrea Ramirez. 2016. "Development of a Methodological Framework for Social Life-Cycle Assessment of Novel

- Technologies." *The International Journal of Life Cycle Assessment*, July, 1–18. <https://doi.org/10.1007/s11367-016-1162-1>.
- Hák, Tomás, Bedrich Moldan, and Arthur Lyon Dahl. 2012. *Sustainability Indicators: A Scientific Assessment*. Island Press.
- Hall, M.R. 2015. "A Transdisciplinary Review of the Role of Economics in Life Cycle Sustainability Assessment." *International Journal of Life Cycle Assessment* 20 (12): 1625–39. <https://doi.org/10.1007/s11367-015-0970-z>.
- Hall, Murray R. 2015. "A Transdisciplinary Review of the Role of Economics in Life Cycle Sustainability Assessment." *The International Journal of Life Cycle Assessment* 20 (12): 1625–39. <https://doi.org/10.1007/s11367-015-0970-z>.
- . 2019. "The Sustainability Price: Expanding Environmental Life Cycle Costing to Include the Costs of Poverty and Climate Change." *The International Journal of Life Cycle Assessment* 24 (2): 223–36. <https://doi.org/10.1007/s11367-018-1520-2>.
- Henderson, Jeffrey, Peter Dicken, Martin Hess, Neil Coe, and Henry Wai-Chung Yeung. 2002. "Global Production Networks and the Analysis of Economic Development." *Review of International Political Economy* 9 (3): 436–64. <https://doi.org/10.1080/09692290210150842>.
- Héraud, Béatrice. 2016. "Devoir de vigilance : ce qui sera demandé aux entreprises." *Novethic*, November 30, 2016. <https://www.novethic.fr/actualite/entreprise-responsable/isr-rse/devoir-de-vigilance-les-mesures-demandees-aux-entreprises-precisees-144195.html>.
- Heuvel, Swenneke G van den, Maartje C. Bakhuys Roozebom, Iris Eekhout, and Anita Venema. 2018. "Management of Psychosocial Risks in European Workplaces: Evidence from the Second European Survey of Enterprises on New and Emerging Risks (ESENER-2) - Safety and Health at Work - EU-OSHA." Bilbao, Spain: European Agency for Safety and Health at Work. <https://osha.europa.eu/en/publications/management-psychosocial-risks-european-workplaces-evidence-second-european-survey/view>.
- Hill, Berkeley, and Dylan Bradley. 2015. "Comparison of Farmers' Incomes in the EU Member States." IP/B/AGRI/IC/2014-68. Brussels, Belgium: Policy Department B: Structural and Cohesion Policies European Parliament. [http://www.europarl.europa.eu/RegData/etudes/STUD/2015/540374/IPOL\\_STU\(2015\)540374\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2015/540374/IPOL_STU(2015)540374_EN.pdf).
- Hofstetter, Patrick, and Gregory A. Norris. 2003. "Why and How Should We Assess Occupational Health Impacts in Integrated Product Policy?" *Environmental Science & Technology* 37 (10): 2025–35. <https://doi.org/10.1021/es025838w>.
- Huang, Lei, Alexi Ernstoff, Peter Fantke, Susan A. Csiszar, and Olivier Jolliet. 2017. "A Review of Models for Near-Field Exposure Pathways of Chemicals in Consumer Products." *Science of The Total Environment* 574 (January): 1182–1208. <https://doi.org/10.1016/j.scitotenv.2016.06.118>.
- Hunkeler, D, K Lichtenwort, and G Rebitzer. 2008. *Environmental Life Cycle Costing*. CRC Press. Boca Raton, FL: SETAC.
- Hunkeler, David. 2006a. "Societal Assessment - A New Subject Area and Call for Papers." *The International Journal of Life Cycle Assessment* 11 (2): 86–86. <https://doi.org/10.1065/lca2006.02.003>.
- . 2006b. "Societal LCA Methodology and Case Study (12 Pp)." *The International Journal of Life Cycle Assessment* 11 (6): 371–82. <https://doi.org/10.1065/lca2006.08.261>.
- Hutchins, Margot J., and John W. Sutherland. 2008. "An Exploration of Measures of Social Sustainability and Their Application to Supply Chain Decisions." *Journal of Cleaner Production, Sustainability and Supply Chain Management*, 16 (15): 1688–98. <https://doi.org/10.1016/j.jclepro.2008.06.001>.
- Huyse, Huib, and Boris Verbrugge. 2018. "Belgium and the Sustainable Supply Chain Agenda: Leader or Laggard? Review of Human Right Due Diligence Initiatives in the Netherlands, Germany, France and EU, and Implications for Policy Work by Belgian Civil Society." Leuven, Belgium: HIVA-KU Leuven.

- [https://hiva.kuleuven.be/en/research/theme/globaldevelopment/p/projects/HRDD\\_report\\_HI\\_VA](https://hiva.kuleuven.be/en/research/theme/globaldevelopment/p/projects/HRDD_report_HI_VA).
- IDELE. 2012. "Coût de Production - Comparaison Des Différents Systèmes." Références. Paris, France: Institut de l'élevage.
- . 2013. "Coût de Production En Élevage Bovins Lait - Manuel de Référence de La Méthode Proposée Par l'Institut de l'élevage." Paris, France: Institut de l'élevage. [http://idele.fr/no\\_cache/recherche/publication/idelesolr/recommends/cout-de-production-en-elevage-bovins-lait.html](http://idele.fr/no_cache/recherche/publication/idelesolr/recommends/cout-de-production-en-elevage-bovins-lait.html).
- IFOAM Organics International. n.d. "Participatory Guarantee Systems (PGS)." Accessed September 14, 2015. <http://www.ifoam.bio/en/value-chain/participatory-guarantee-systems-pgs>.
- IISD. n.d. "Contract Farming: Challenges and a New Tool for Success." International Institute for Sustainable Development. Accessed February 2, 2019. <https://www.iisd.org/blog/model-contract-farming>.
- ILO. 2009. "Agriculture: A Hazardous Work." Document. International Labour Organization. June 15, 2009. [http://www.ilo.org/safework/areasofwork/hazardous-work/WCMS\\_110188/lang--en/index.htm](http://www.ilo.org/safework/areasofwork/hazardous-work/WCMS_110188/lang--en/index.htm).
- . 2014. "Global Wage Report 2014/15 - Wages and Income Inequality." Report. Geneva, Switzerland: International Labour Organization. [http://www.ilo.org/global/publications/books/WCMS\\_324678/lang--en/index.htm](http://www.ilo.org/global/publications/books/WCMS_324678/lang--en/index.htm).
- . 2015. "World Employment and Social Outlook: The Changing Nature of Jobs." Geneva, Switzerland: International Labour Organization. [http://www.ilo.org/global/research/global-reports/weso/2015-changing-nature-of-jobs/WCMS\\_368626/lang--en/index.htm](http://www.ilo.org/global/research/global-reports/weso/2015-changing-nature-of-jobs/WCMS_368626/lang--en/index.htm).
- . 2016. "Non-Standard Employment around the World: Understanding Challenges, Shaping Prospects." Geneva, Switzerland: International Labour Organization. [https://www.ilo.org/global/publications/books/WCMS\\_534326/lang--en/index.htm](https://www.ilo.org/global/publications/books/WCMS_534326/lang--en/index.htm).
- . 2017a. "Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy (MNE Declaration) - 5th Edition (2017) (ENTERPRISES)." International Labour Organization. 2017. <https://www.ilo.org/empent/areas/mne-declaration/lang--en/index.htm>.
- . 2017b. "World Employment and Social Outlook – Trends 2017." Geneva, Switzerland: International Labour Organization. <http://www.ilo.org/global/research/global-reports/weso/2017/lang--en/index.htm>.
- . 2017c. "Global Estimates of Child Labour: Results and Trends, 2012-2016." Report. Geneva, Switzerland: International Labour Organization. [http://www.ilo.org/global/publications/books/WCMS\\_575499/lang--en/index.htm](http://www.ilo.org/global/publications/books/WCMS_575499/lang--en/index.htm).
- . 2017d. "Global Estimates of Modern Slavery: Forced Labour and Forced Marriage." Report. Geneva, Switzerland: International Labour Organization. [http://www.ilo.org/global/publications/books/WCMS\\_575479/lang--en/index.htm](http://www.ilo.org/global/publications/books/WCMS_575479/lang--en/index.htm).
- . 2018. "World Employment and Social Outlook: Trends 2018." Geneva, Switzerland: International Labour Organization. [https://www.ilo.org/global/research/global-reports/weso/2018/WCMS\\_615594/lang--en/index.htm](https://www.ilo.org/global/research/global-reports/weso/2018/WCMS_615594/lang--en/index.htm).
- . 2019a. "World Employment and Social Outlook: Trends 2019." Report. Geneva, Switzerland: International Labour Organization. [http://www.ilo.org/global/research/global-reports/weso/2019/WCMS\\_670542/lang--en/index.htm](http://www.ilo.org/global/research/global-reports/weso/2019/WCMS_670542/lang--en/index.htm).
- . 2019b. "Safety and Health at the Heart of the Future of Work: Building on 100 Years of Experience." Report. Geneva, Switzerland: International Labour Organization. [https://www.ilo.org/global/topics/safety-and-health-at-work/events-training/events-meetings/world-day-for-safety/WCMS\\_686645/lang--en/index.htm](https://www.ilo.org/global/topics/safety-and-health-at-work/events-training/events-meetings/world-day-for-safety/WCMS_686645/lang--en/index.htm).
- . 2019c. "New Safety and Health Issues Emerge as Work Changes." Press release. International Labour Organization. April 18, 2019. [http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS\\_686571/lang--en/index.htm](http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_686571/lang--en/index.htm).
- . 2019d. "The Working Poor - or How a Job Is No Guarantee of Decent Living Conditions." Publication. Geneva, Switzerland: International Labour Organization.



- [http://www.ilo.org/global/statistics-and-databases/publications/WCMS\\_696387/lang--en/index.htm](http://www.ilo.org/global/statistics-and-databases/publications/WCMS_696387/lang--en/index.htm).
- . 2019e. “The Global Labour Income Share and Distribution.” Publication. Geneva, Switzerland: International Labour Organization. [http://www.ilo.org/global/statistics-and-databases/publications/WCMS\\_712232/lang--en/index.htm](http://www.ilo.org/global/statistics-and-databases/publications/WCMS_712232/lang--en/index.htm).
- . n.d. “Agriculture; Plantations; Other Rural Sectors.” Institutional. International Labour Organization. Accessed January 11, 2019. <https://www.ilo.org/global/industries-and-sectors/agriculture-plantations-other-rural-sectors/lang--en/index.htm>.
- INSEE. 2014. “France, Portrait Social.” Paris, France: INSEE. <https://www.insee.fr/fr/statistiques/1288529>.
- Iofrida, Nathalie, Anna Irene De Luca, Frederica Silveri, Giacomo Falcone, Teodora Stillitano, Giovanni Gulisano, and Alfio Strano. 2019. “Psychosocial Risk Factors’ Impact Pathway for Social Life Cycle Assessment: An Application to Citrus Life Cycles in South Italy.” *The International Journal of Life Cycle Assessment* 24 (4): 767–80. <https://doi.org/10.1007/s11367-018-1482-4>.
- Iofrida, Nathalie, Anna Irene De Luca, Alfio Strano, and Giovanni Gulisano. 2018. “Can Social Research Paradigms Justify the Diversity of Approaches to Social Life Cycle Assessment?” *The International Journal of Life Cycle Assessment* 23 (3): 464–80. <https://doi.org/10.1007/s11367-016-1206-6>.
- Iofrida, Nathalie, Anna Irene De Luca, Alfio Strano, and Giovanni Gulisano. 2016. “Can Social Research Paradigms Justify the Diversity of Approaches to Social Life Cycle Assessment?” *The International Journal of Life Cycle Assessment*, September, 1–17. <https://doi.org/10.1007/s11367-016-1206-6>.
- ISO. 2018. “Discovering ISO 26000.” International Organization for Standardization. <https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100258.pdf>.
- . n.d. “ISO 26000 Social Responsibility.” ISO. Accessed April 29, 2019. <http://www.iso.org/cms/render/live/en/sites/isoorg/home/standards/popular-standards/iso-26000-social-responsibility.html>.
- Jackson, Tim, and Roland Clift. 1998. “Where’s the Profit in Industrial Ecology?” *Journal of Industrial Ecology* 2 (1): 3–5. <https://doi.org/10.1162/jiec.1998.2.1.3>.
- Jolliet, Olivier. 2010. *Analyse Du Cycle de Vie: Comprendre et Réaliser Un Écobilan*. Presses polytechniques et universitaires romandes. Lausanne.
- Jolliet, Olivier, Ruedi Müller-Wenk, Jane Bare, Alan Brent, Mark Goedkoop, Reinout Heijungs, Norihiro Itsubo, et al. 2004. “The LCIA Midpoint-Damage Framework of the UNEP/SETAC Life Cycle Initiative.” *The International Journal of Life Cycle Assessment* 9 (6): 394–404. <https://doi.org/10.1007/BF02979083>.
- Jørgensen, Andreas, Agathe Le Bocq, Liudmila Nazarkina, and Michael Hauschild. 2007. “Methodologies for Social Life Cycle Assessment.” *The International Journal of Life Cycle Assessment* 13 (2): 96–103. <https://doi.org/10.1065/lca2007.11.367>.
- Jørgensen, Andreas, Ivan T. Hermann, and Jørgen Birk Mortensen. 2010. “Is LCC Relevant in a Sustainability Assessment?” *The International Journal of Life Cycle Assessment* 15 (6): 531–32. <https://doi.org/10.1007/s11367-010-0185-2>.
- Jørgensen, Andreas, Ivan T. Herrmann, and Anders Bjørn. 2013. “Analysis of the Link between a Definition of Sustainability and the Life Cycle Methodologies.” *The International Journal of Life Cycle Assessment* 18 (8): 1440–49. <https://doi.org/10.1007/s11367-013-0617-x>.
- Jørgensen, Andreas, Michael S. Jørgensen, Matthias Finkbeiner, and Michael Z. Hauschild. 2010. “Defining the Baseline in Social Life Cycle Assessment.” *The International Journal of Life Cycle Assessment* 15 (4): 376–84. <https://doi.org/10.1007/s11367-010-0176-3>.
- Jørgensen, Andreas, Lufanna C. H. Lai, and Michael Z. Hauschild. 2009. “Assessing the Validity of Impact Pathways for Child Labour and Well-Being in Social Life Cycle Assessment.” *The International Journal of Life Cycle Assessment* 15 (1): 5–16. <https://doi.org/10.1007/s11367-009-0131-3>.
- Kelly, Ilona M., Christie Miedema, Ben Vanpeperstraete, and Ilana Winterstein. 2019. “Fig Leaf for Fashion. How Social Auditing Protects Brands and Fails Workers.” File. Amsterdam, The

- Netherlands: Clean clothes campaign. <https://cleanclothes.org/file-repository/figleaf-for-fashion.pdf/view>.
- Kloepffer, Walter. 2008a. "Life Cycle Sustainability Assessment of Products." *The International Journal of Life Cycle Assessment* 13 (2): 89–95. <https://doi.org/10.1065/lca2008.02.376>.
- . 2008b. "Life Cycle Sustainability Assessment of Products." *The International Journal of Life Cycle Assessment* 13 (2): 89. <https://doi.org/10.1065/lca2008.02.376>.
- Kneafsey, Moya, Laura Venn, Matthew Blackett, Gemma Sutton, Ulrich Schmutz, Elizabeth Bos, Bálint Balázs, Trish Eyden-Wood, and Liz Trenchard. 2013. "Short Food Supply Chains and Local Food Systems in the EU. A State of Play of Their Socio-Economic Characteristics." EC Joint Research Centre. <http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=6279>.
- Knight, Carly R., and Christopher Winship. 2013. "The Causal Implications of Mechanistic Thinking: Identification Using Directed Acyclic Graphs (DAGs)." In *Handbook of Causal Analysis for Social Research*, edited by Stephen L. Morgan, 275–99. Handbooks of Sociology and Social Research. Dordrecht: Springer Netherlands. [https://doi.org/10.1007/978-94-007-6094-3\\_14](https://doi.org/10.1007/978-94-007-6094-3_14).
- Kruse, Sarah A., Anna Flysjö, Nadja Kasperczyk, and Astrid J. Scholz. 2008. "Socioeconomic Indicators as a Complement to Life Cycle Assessment—an Application to Salmon Production Systems." *The International Journal of Life Cycle Assessment* 14 (1): 8–18. <https://doi.org/10.1007/s11367-008-0040-x>.
- Kühnen, Michael, and Rüdiger Hahn. 2017. "Indicators in Social Life Cycle Assessment: A Review of Frameworks, Theories, and Empirical Experience." *Journal of Industrial Ecology* 21 (6): 1547–65. <https://doi.org/10.1111/jiec.12663>.
- . 2018. "Systemic Social Performance Measurement: Systematic Literature Review and Explanations on the Academic Status Quo from a Product Life-Cycle Perspective." *Journal of Cleaner Production* 205 (December): 690–705. <https://doi.org/10.1016/j.jclepro.2018.08.201>.
- La Libre. 2018. "Le lait équitable 'C'est qui le patron?' arrive en rayons en Belgique." *La Libre*, February 21, 2018, sec. économie. <https://www.lalibre.be/economie/entreprises-startup/le-lait-equitable-c-est-qui-le-patron-arrive-en-rayons-en-belgique-5a8d7c4acd70b558ed7a5b2d>.
- La société des consommateurs. n.d. "Le Lait Des Consommateurs !" La Marque Du Consommateur. Accessed April 20, 2020. <https://lamarqueduconsommateur.com/produits/lait/>.
- La Spina, Sylvie. 2016. "Pistes d'avenir pour le secteur laitier wallon - Compte-rendu des rencontres citoyennes dans le cadre du projet « Echangeons sur notre agriculture »." Jambes, Belgique: Nature et Progrès Belgique. <https://natproconsommateurs.files.wordpress.com/2016/01/9-rapport-lait-final.pdf>.
- Labuschagne, Carin, Alan C. Brent, and Ron P. G. van Erck. 2005. "Assessing the Sustainability Performances of Industries." *Journal of Cleaner Production* 13 (4): 373–85. <https://doi.org/10.1016/j.jclepro.2003.10.007>.
- Lagarde, Vincent, and Catherine Macombe. 2012. "Designing the Social Life Cycle of Products from the Systematic Competitive Model." *The International Journal of Life Cycle Assessment* 18 (1): 172–84. <https://doi.org/10.1007/s11367-012-0448-1>.
- Lambaré, Pierre, Marie Dervillé, and Gérard You. 2018. "Quelles conditions d'accès au marché des éleveurs après les quotas laitiers ?." *Economie rurale* n° 364 (2): 55–71.
- Lebacqz, Thérèse. 2015. "La Durabilité Des Exploitations Laitières En Wallonie - Analyse de La Diversité et Voies de Transition." Ph.D. Thesis, Louvain-la-neuve: Université catholique de Louvain (UCL).
- Lee, Joonkoo. 2010. "Global Commodity Chains and Global Value Chains." In *The International Studies Encyclopedia*, Wiley-Blackwell, 2987–3006. Robert A. Denemark. [https://www.researchgate.net/publication/237784248\\_Global\\_Commodity\\_Chains\\_and\\_Global\\_Value\\_Chains](https://www.researchgate.net/publication/237784248_Global_Commodity_Chains_and_Global_Value_Chains).
- . 2016. "Global Supply Chain Dynamics and Labour Governance: Implications for Social Upgrading." ILO research paper 14. Geneva, Switzerland: International labour Office. <http://www.ssrn.com/abstract=2780512>.

- Legifrance. 2017. *LOI N° 2017-399 Du 27 Mars 2017 Relative Au Devoir de Vigilance Des Sociétés Mères et Des Entreprises Donneuses d'ordre*. <https://www.legifrance.gouv.fr/eli/loi/2017/3/27/2017-399/jo/texte>.
- Life Cycle Initiative. 2005. "Life Cycle Approaches - The Road from Analysis to Practice." Paris, France: UNEP/ SETAC. <https://www.lifecycleinitiative.org/wp-content/uploads/2012/12/2005%20-%20LCA.pdf>.
- L'Obs. 2019. "Agriculture, élevage: les chiffres d'une 'surmortalité par suicide,'" September 18, 2019. <https://www.nouvelobs.com/societe/20190918.AFP4893/agriculture-elevage-les-chiffres-d-une-surmortalite-par-suicide.html>.
- Lock, Irina, and Peter Seele. 2016. "The Credibility of CSR (Corporate Social Responsibility) Reports in Europe. Evidence from a Quantitative Content Analysis in 11 Countries." *Journal of Cleaner Production* 122: 186–200. <https://doi.org/10.1016/j.jclepro.2016.02.060>.
- Locke, Richard M. 2013. *The Promise and Limits of Private Power: Promoting Labor Standards in a Global Economy*. New York, USA: Cambridge University Press.
- Lohmann, Henning, and Ivo Marx. 2018. *Handbook on In-Work Poverty*. Edward Elgar Publishing. <https://doi.org/10.4337/9781784715632>.
- Macombe, Catherine. 2013a. *ACV Sociales, Effets Socio-Économiques Des Chaines de Valeurs*. Fruitrop Thema. CIRAD.
- . 2013b. *ACV Sociales, Effets Socio-Économiques Des Chaines de Valeurs*. Fruitrop Thema. Montpellier, France: CIRAD.
- . 2013c. "How Can One Predict Social Effects and Impacts?" In *Social LCAs - Socio-Economic Effects in Value Chains*. Fruitrop Thema. CIRAD/IRSTEA.
- Macombe, Catherine, and Alain Falque. 2013. "An Alternative to Life Cycle CSR." In *Social LCAs - Socio-Economic Effects in Value Chains*, Fruitrop Thema, 21–34. Montpellier, France: CIRAD.
- Macombe, Catherine, Pekka Leskinen, Pauline Feschet, and Riina Antikainen. 2013. "Social Life Cycle Assessment of Biodiesel Production at Three Levels: A Literature Review and Development Needs." *Journal of Cleaner Production* 52: 205–16. <https://doi.org/10.1016/j.jclepro.2013.03.026>.
- Macombe, Catherine, and Denis Loeillet. 2013. "Social Life Cycle Assessment, for Who and Why?" In *Social LCAs - Socio-Economic Effects in Value Chains*. Fruitrop Thema. CIRAD/IRSTEA.
- Manhart, Andreas, and Rainer Grießhammer. 2006. "Social Impacts of the Production of Notebook PCs Contribution to the Development of a Product Sustainability Assessment (PROSA)." Freiburg, Germany: Öko-Institut e.V.
- Manik, Yosef, Jessica Leahy, and Anthony Halog. 2013. "Social Life Cycle Assessment of Palm Oil Biodiesel: A Case Study in Jambi Province of Indonesia." *The International Journal of Life Cycle Assessment* 18 (7): 1386–92. <https://doi.org/10.1007/s11367-013-0581-5>.
- Martin, Philip L. 2016. "Migrant Workers in Commercial Agriculture." Technical report. Geneva, Switzerland: International Labour Office, Sectoral Policies Department, Conditions of Work and Equality Department. [https://www.ilo.org/wcmsp5/groups/public/---ed\\_protect/---protrav/---migrant/documents/publication/wcms\\_538710.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---migrant/documents/publication/wcms_538710.pdf).
- Mathe, Syndhia. 2014. "Integrating Participatory Approaches into Social Life Cycle Assessment: The SLCA Participatory Approach." *The International Journal of Life Cycle Assessment* 19 (8): 1506–14. <https://doi.org/10.1007/s11367-014-0758-6>.
- Mattioda, Rosana Adami, Anna Mazzi, Osiris Canciglieri Jr, and Antonio Scipioni. 2015. "Determining the Principal References of the Social Life Cycle Assessment of Products." *The International Journal of Life Cycle Assessment*, March, 1–11. <https://doi.org/10.1007/s11367-015-0873-z>.
- Mazijn, Bernard. n.d. "Social LC Alliance." Institute for Sustainable Development. Accessed April 10, 2016. <http://www.instituutvoorduurzameontwikkeling.be/en/projects/social-lc-alliance/>.
- Mazijn, Bernard, Rudi Doom, Herwig Peeters, Sophie Spillemaeckers, Griet Vanhoutte, Liesbeth Taverniers, Luc Lavrysen, Dirk Van Braeckel, and Jorge Duque Rivera. 2004. "Ecological, Social and Economic Aspects of Integrated Product Policy - Integrated Product Assessment and the

- Development of the Label 'Sustainable Development' for Products: Final Report." Project CP/20. Brussels, Belgium: UGhent-CDO/Ethibel, Belgian Science Policy.
- Mccool, Stephen F., and George H. Stankey. 2004. "Indicators of Sustainability: Challenges and Opportunities at the Interface of Science and Policy." *Environmental Management* 33 (3): 294–305. <https://doi.org/10.1007/s00267-003-0084-4>.
- Meert, H., G. Van Huylenbroeck, T. Vernimmen, M. Bourgeois, and E. van Hecke. 2005. "Farm Household Survival Strategies and Diversification on Marginal Farms." *Journal of Rural Studies* 21 (1): 81–97. <https://doi.org/10.1016/j.jrurstud.2004.08.007>.
- Mendoza, Guillermo A., and Ravi Prabhu. 2000. "Development of a Methodology for Selecting Criteria and Indicators of Sustainable Forest Management: A Case Study on Participatory Assessment." *Environmental Management* 26 (6): 659–73. <https://doi.org/10.1007/s002670010123>.
- Menikpura, S. N. M., Shabbir H. Gheewala, and Sébastien Bonnet. 2012. "Framework for Life Cycle Sustainability Assessment of Municipal Solid Waste Management Systems with an Application to a Case Study in Thailand." *Waste Management & Research*, May. <https://doi.org/10.1177/0734242X12444896>.
- Merel, Pierre R. 2007. "Efficiency and Redistribution in the French Comte Cheese Market." In *103rd EAAE Seminar "Adding Value to the Agro-Food Supply Chain in the Future Euromediterranean Space."* Barcelona, Spain: European Association of Agricultural Economists. <https://ideas.repec.org/p/ags/eea103/9396.html>.
- Mevel, Olivier. 2013. "Les relations entre la production et la distribution : le cas du partage de la valeur ajoutée dans la filière laitière française." *Annales des Mines - Gérer et comprendre*, no. 101 (October): 38–49.
- Ministère de l'agriculture et de l'alimentation. 2018. "#EGalim : tout savoir sur la loi Agriculture et Alimentation." Alim'agri. 2018. <https://agriculture.gouv.fr/egalim-tout-savoir-sur-la-loi-agriculture-et-alimentation>.
- Mondelaers, Koen, Myriam Baecke, and Ludwig Lauwers. 2014. "Coping with Market Power: Dairy Farmers' Interest in Producers' Organizations and Contracts." In . <https://biblio.ugent.be/publication/7152305>.
- Mooney, Pat. 2017. "Too Big to Feed: Exploring the Impacts of Mega-Mergers, Consolidation, Concentration of Power in the Agri-Food Sector." Brussels, Belgium: IPES-Food. [http://www.ipes-food.org/\\_img/upload/files/Concentration\\_ExecSummary.pdf](http://www.ipes-food.org/_img/upload/files/Concentration_ExecSummary.pdf).
- Moray, Nathalie. 2019. "Confrontation de Deux Méthodes d'analyse Sociale Du Cycle de Vie à Partir de La Caractérisation Des Apports Socioéconomiques d'un Système En Circuit Court de Proximité Par Le Biais de l'ASCV d'une Production Maraîchère Wallonne." Mémoire de master, Université Libre de Bruxelles. <http://mem-envi.ulb.ac.be/>.
- Morenville, Catherine. 2003. "Label social belge : peut mieux faire...." *Revue Démocratie* (blog). 2003. <http://www.revue-democratie.be/index.php/economie/11-developpement/210-label-social-belge-peut-mieux-faire>.
- Musaazi, Moses Kizza, Abigail R. Mechtenberg, Juliet Nakibuule, Rachel Sensenig, Emmanuel Miyingo, John Vianney Makanda, Ali Hakimian, and Matthew J. Eckelman. 2015. "Quantification of Social Equity in Life Cycle Assessment for Increased Sustainable Production of Sanitary Products in Uganda." *Journal of Cleaner Production*, Integrating Cleaner Production into Sustainability Strategies, 96: 569–79. <https://doi.org/10.1016/j.jclepro.2013.10.026>.
- Namkoong, G., T. Boyle, Y. A. El-Kassaby, C. Palmberg-Lerche, G. Eriksson, H-R. Gregorius, H. Joly, et al. 2002. "Criteria and Indicators for Sustainable Forest Management: Assessment and Monitoring of Genetic Variation." FAO. 2002. <http://www.fao.org/docrep/005/ac649e/ac649e0b.htm>.
- Nemarumane, Takalani Musundwa, and Charles Mbohwa. 2015. "Social Life Cycle Assessment in the South African Sugar Industry: Issues and Views." In *Social Life Cycle Assessment*, edited by Subramanian Senthilkannan Muthu, 71–113. Environmental Footprints and Eco-Design of Products and Processes. Springer Singapore. [http://link.springer.com/chapter/10.1007/978-981-287-296-8\\_3](http://link.springer.com/chapter/10.1007/978-981-287-296-8_3).

- Neugebauer, Sabrina. 2016. "Enhancing Life Cycle Sustainability Assessment Tiered Approach and New Characterization Models for Social Life Cycle Assessment and Life Cycle Costing." Berlin, Germany: Technischen Universität Berlin.
- Neugebauer, Sabrina, Vanessa Bach, Matthias Finkbeiner, and Denise Fischer. 2014. "Social Indicators for Meat Production – Addressing Workers, Local Communities, Consumers and Animals." In . <http://lcafood2014.org/papers/134.pdf>.
- Neugebauer, Sabrina, Yasmine Emara, Christine Hellerström, and Matthias Finkbeiner. 2016. "Calculation of Fair Wage Potentials along Products' Life Cycle – Introduction of a New Midpoint Impact Category for Social Life Cycle Assessment." *Journal of Cleaner Production*. <https://doi.org/10.1016/j.jclepro.2016.11.172>.
- Neugebauer, Sabrina, Silvia Forin, and Matthias Finkbeiner. 2016. "From Life Cycle Costing to Economic Life Cycle Assessment—Introducing an Economic Impact Pathway." *Sustainability* 8 (5): 428. <https://doi.org/10.3390/su8050428>.
- Neugebauer, Sabrina, Marzia Traverso, René Scheumann, Ya-Ju Chang, Kirana Wolf, and Matthias Finkbeiner. 2014. "Impact Pathways to Address Social Well-Being and Social Justice in SLCA—Fair Wage and Level of Education." *Sustainability* 6 (8): 4839–57. <https://doi.org/10.3390/su6084839>.
- Norris, Gregory A. 2006. "Social Impacts in Product Life Cycles - Towards Life Cycle Attribute Assessment." *The International Journal of Life Cycle Assessment* 11 (1): 97–104. <https://doi.org/10.1065/lca2006.04.017>.
- O'Brien, Martin, Alison Doig, and Roland Clift. 1996. "Social and Environmental Life Cycle Assessment (SELCA)." *The International Journal of Life Cycle Assessment* 1 (4): 231–37. <https://doi.org/10.1007/BF02978703>.
- Observatoire bruxellois de l'emploi. 2014. "Secteur Commerce - Actualité et Perspectives." Veille & Anticipation Emploi, Formation et Intermédiation Sur Le Marché Du Travail à Bruxelles. Bruxelles, Belgique: Observatoire bruxellois de l'emploi. [http://www.actiris.be/Portals/36/Documents/FR/Veille%20et%20anticipation\\_Commerce.pdf](http://www.actiris.be/Portals/36/Documents/FR/Veille%20et%20anticipation_Commerce.pdf).
- Observatoire des prix. 2014. "Mise à Jour de l'étude Sur La Filière Laitière." Brussels, Belgium: Institut des comptes nationaux, SPF Economie. [https://economie.fgov.be/fr/file/2895/download?token=x126B\\_15](https://economie.fgov.be/fr/file/2895/download?token=x126B_15).
- OFPM. 2017. "Rapport Au Parlement 2017." Paris, France: Observatoire de la formation des prix et des marges des produits alimentaires. <https://www.franceagrimer.fr/content/download/50772/487917/file/Rapport%20au%20parlement%202017%20.pdf>.
- . 2019. "Rapport Au Parlement 2019." Paris, France: Observatoire de la formation des prix et des marges des produits alimentaires. [https://observatoire-prixmarges.franceagrimer.fr/sites/default/files/sauv/documents-divers/rapport\\_au\\_parlement\\_2019\\_version\\_site\\_internet.pdf](https://observatoire-prixmarges.franceagrimer.fr/sites/default/files/sauv/documents-divers/rapport_au_parlement_2019_version_site_internet.pdf).
- OHCHR. 2011. "Corporate Human Rights Due Diligence – Identifying and Leveraging Emerging Practice." UN Human Rights Office of the High Commissioner. 2011. <https://www.ohchr.org/EN/Issues/Business/Pages/CorporateHRDueDiligence.aspx>.
- Onat, Nuri Cihat, Murat Kucukvar, Anthony Halog, and Scott Cloutier. 2017. "Systems Thinking for Life Cycle Sustainability Assessment: A Review of Recent Developments, Applications, and Future Perspectives." *Sustainability* 9 (5): 706. <https://doi.org/10.3390/su9050706>.
- Parent, Julie, Carmela Cucuzzella, and Jean-Pierre Revéret. 2010. "Impact Assessment in SLCA: Sorting the SLCIA Methods According to Their Outcomes." *The International Journal of Life Cycle Assessment* 15 (2): 164–71. <https://doi.org/10.1007/s11367-009-0146-9>.
- Paysan Breton. 2020. "Pour avoir du bio, les laiteries doivent mettre le prix," September 2, 2020. <https://www.paysan-breton.fr/2020/02/pour-avoir-du-bio-les-laiteries-doivent-mettre-le-prix/>.
- Petti, Luigia, Paola Karina Sanchez Ramirez, Marzia Traverso, and Cassia Maria Lie Ugaya. 2016. "An Italian Tomato 'Cuore Di Bue' Case Study: Challenges and Benefits Using Subcategory

- Assessment Method for Social Life Cycle Assessment." *The International Journal of Life Cycle Assessment*, August, 1–12. <https://doi.org/10.1007/s11367-016-1175-9>.
- Petti, Luigia, Monica Serreli, and Silvia Di Cesare. 2016. "Systematic Literature Review in Social Life Cycle Assessment." *The International Journal of Life Cycle Assessment*, June, 1–10. <https://doi.org/10.1007/s11367-016-1135-4>.
- Prabhu, R., C.J.P. Colfer, and R.G. Dudley. 1999. "Guidelines for Developing, Testing and Selecting Criteria and Indicators for Sustainable Forest Management." Center for International Forestry Research. [http://ciifad.cals.cornell.edu/sites/ciifad.cals.cornell.edu/files/shared/documents/ME\\_CIFORToolbox.pdf](http://ciifad.cals.cornell.edu/sites/ciifad.cals.cornell.edu/files/shared/documents/ME_CIFORToolbox.pdf).
- PRé Sustainability. 2017. "Updated ReCiPe2016 Implemented in SimaPro." SimaPro. March 13, 2017. <https://simapro.com/2017/updated-impact-assessment-methodology-recipe-2016/>.
- Purvis, Ben, Yong Mao, and Darren Robinson. 2019. "Three Pillars of Sustainability: In Search of Conceptual Origins." *Sustainability Science* 14 (3): 681–95. <https://doi.org/10.1007/s11625-018-0627-5>.
- Quairel, Françoise, and Michel Capron. 2013. *Le couplage « responsabilité sociale des entreprises » et « développement durable » : mise en perspective, enjeux et limites*. Vol. 11. La Découverte. [http://www.cairn.info/resume.php?ID\\_ARTICLE=RFSE\\_011\\_0125](http://www.cairn.info/resume.php?ID_ARTICLE=RFSE_011_0125).
- Raikes, Philip, Michael Friis Jensen, and Stefano Ponte. 2000. "Global Commodity Chain Analysis and the French Filière Approach: Comparison and Critique." *Economy and Society* 29 (3): 390–417. <https://doi.org/10.1080/03085140050084589>.
- Ramirez, Paola Karina Sanchez, Luigia Petti, Nara Tudela Haberland, and Cássia Maria Lie Ugaya. 2014. "Subcategory Assessment Method for Social Life Cycle Assessment. Part 1: Methodological Framework." *The International Journal of Life Cycle Assessment* 19 (8): 1515–23. <https://doi.org/10.1007/s11367-014-0761-y>.
- Ramirez, Paola Karina Sanchez, Luigia Petti, and Cassia Maria Lie Ugaya. 2014. "Subcategory Assessment Method for Social LCA: A First Application on the Wine Sector." In *Pathways to Environmental Sustainability*, edited by Roberta Salomone and Giuseppe Saija, 107–16. Springer International Publishing. [http://link.springer.com/chapter/10.1007/978-3-319-03826-1\\_11](http://link.springer.com/chapter/10.1007/978-3-319-03826-1_11).
- Reed, Mark S, and Andrew J Dougill. 2002. "Participatory Selection Process for Indicators of Rangeland Condition in the Kalahari." *Geographical Journal* 168 (3): 224–34. <https://doi.org/10.1111/1475-4959.00050>.
- Reitinger, Claudia, Matthias Dumke, Mario Barosevic, and Rafaela Hillerbrand. 2011. "A Conceptual Framework for Impact Assessment within SLCA." *The International Journal of Life Cycle Assessment* 16 (4): 380–88. <https://doi.org/10.1007/s11367-011-0265-y>.
- Revéret, Jean-Pierre, Jean-Michel Couture, and Julie Parent. 2015. "Socioeconomic LCA of Milk Production in Canada." In *Social Life Cycle Assessment*, edited by Subramanian Senthilkannan Muthu, 25–69. Environmental Footprints and Eco-Design of Products and Processes. Springer Singapore. [http://link.springer.com/chapter/10.1007/978-981-287-296-8\\_2](http://link.springer.com/chapter/10.1007/978-981-287-296-8_2).
- Rey-Valette H., Clément O., Aubin J., Mathé S., Chia E., Legendre M., Caruso D., et al. 2008. *Guide to the Co-Construction of Sustainable Development Indicators in Aquaculture*. CIRAD, INRA, Ifremer, IRD, UM1.
- Rigot, Véronique. 2019. "Un traité international pour les entreprises et les droits humains." CNCD-11.11.11. October 14, 2019. <https://www.cncd.be/Un-traite-international-pour-les>.
- Rizet, Christophe, Michael Brown, Jacques Leonardi, Julian Allen, Marzena Piotrowska, Eric Cornelis, and Julien Descamps. 2008. "Chaînes Logistiques et Consommation d'énergie : Cas Des Meubles et Des Fruits et Légumes." Noisy Le Grand, France: INRETS. <https://hal.archives-ouvertes.fr/hal-00544563/document>.
- RMT Economie des filières animales. 2013. "Coût de Production Des Filières Animales et Végétales: Méthodologie et Éléments d'analyse." [http://idele.fr/fileadmin/medias/Images/Bandeaux/Fiches\\_couprod\\_RMTeco\\_.pdf](http://idele.fr/fileadmin/medias/Images/Bandeaux/Fiches_couprod_RMTeco_.pdf).

- Roman, Philippe, Géraldine Thiry, and Tom Bauler. 2016. "Comment mesurer la soutenabilité ?" *L'Économie politique*, no. 69 (February): 48–55.
- Rosenfeld, Martin, Helene Marcelle, and Andrea Rea. 2010. *Opportunités du marché de l'emploi et carrières migratoires: Etudes de cas*. Academia Press. <http://hdl.handle.net/2013/>.
- Roser, Max, and Esteban Ortiz-Ospina. 2019. "Global Extreme Poverty." *Our World in Data*. <https://ourworldindata.org/extreme-poverty>.
- Rossi, Arianna. 2011. "Economic and Social Upgrading in Global Production Networks: The Case of the Garment Industry in Morocco." Brighton, UK: Institute of Development Studies, University of Sussex. <http://sro.sussex.ac.uk/>.
- RTBF. 2018. "Le lait bio 100% belge Biomilk.be arrive dans les Delhaize." *Vivacité*. June 5, 2018. [https://www.rtbef.be/vivacite/emissions/detail\\_quoi-de-neuf/accueil/article\\_le-lait-bio-100-belge-biomilk-be-arrive-dans-les-delhaize?id=9937118&programId=11530](https://www.rtbef.be/vivacite/emissions/detail_quoi-de-neuf/accueil/article_le-lait-bio-100-belge-biomilk-be-arrive-dans-les-delhaize?id=9937118&programId=11530).
- Russo Garrido, Sara, J. Parent, L. Beaulieu, and J.-P. Revéret. 2016a. "A Literature Review of Type I SLCA—Making the Logic Underlying Methodological Choices Explicit," 2016. Scopus. <https://doi.org/10.1007/s11367-016-1067-z>.
- Russo Garrido, Sara, Julie Parent, Luce Beaulieu, and Jean-Pierre Revéret. 2016b. "A Literature Review of Type I SLCA—Making the Logic Underlying Methodological Choices Explicit." *The International Journal of Life Cycle Assessment*, February, 1–13. <https://doi.org/10.1007/s11367-016-1067-z>.
- Sakellariou, Nicholas. 2016. "A Historical Perspective on the Engineering Ideologies of Sustainability: The Case of SLCA." *The International Journal of Life Cycle Assessment*, July, 1–11. <https://doi.org/10.1007/s11367-016-1167-9>.
- Sala, Serenella, Francesca Farioli, and Alessandra Zamagni. 2012. "Life Cycle Sustainability Assessment in the Context of Sustainability Science Progress (Part 2)." *The International Journal of Life Cycle Assessment* 18 (9): 1686–97. <https://doi.org/10.1007/s11367-012-0509-5>.
- Schmidt, Isabell, Manfred Meurer, Peter Saling, Andreas Kicherer, Wolfgang Reuter, and Carl-Otto Gensch. 2004. "SEEBalance: Managing Sustainability of Products and Processes with the Socio-Eco-Efficiency Analysis by BASF." *Greener Management International*, no. 45 (Spring): 79–94.
- Schoeneboom, Jan, Peter Saling, and Martijn Gipmans. 2012. "AgBalance™ Technical Background Paper." BASF. [http://www.agro.basf.com/agr/AP-Internet/en/function/conversions:/publish/upload/sustainability/AgBalance/307736\\_BASF\\_Tech-E\\_Paper-AgBalance.pdf](http://www.agro.basf.com/agr/AP-Internet/en/function/conversions:/publish/upload/sustainability/AgBalance/307736_BASF_Tech-E_Paper-AgBalance.pdf).
- Schuh, B. 2019. "The EU Farming Employment: Current Challenges and Future Prospects." Research for AGRI Committee. Brussels, Belgium: European Parliament, Policy Department for Structural and Cohesion Policies. [https://www.europarl.europa.eu/RegData/etudes/STUD/2019/629209/IPOL\\_STU\(2019\)629209\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2019/629209/IPOL_STU(2019)629209_EN.pdf).
- Silveri, Federica. 2016. "Anticipating Psychosocial Factors Effects in the Agri-Food Sector: The Siegrist's Pathway." Presented at the « Ecole-chercheurs » on Social Life Cycle Assessment Application to agriculture and agrifood sectors, Sète, France, March 17. <http://social-lca.cirad.fr/ecole-chercheurs-2016>.
- Sim, Sarah. 2006. "Sustainable Food Supply Chains." PhD Thesis, University of Surrey.
- Slootweg, R., F. Vanclay, and M. Van Schooten. 2001. "Function Evaluation as a Framework for the Integration of Social and Environmental Impact Assessment." *Impact Assessment and Project Appraisal* 19 (1): 19–28.
- Social LC Alliance. 2018. "The Revision of the SLCA Guidelines." *Social LC Alliance* (blog). February 14, 2018. <https://www.social-lca.org/the-revision-of-the-slca-guidelines/>.
- Souza, R. G., J. Rosenhead, S. P. Salhofer, R. A. B. Valle, and M. P. E. Lins. 2015. "Definition of Sustainability Impact Categories Based on Stakeholder Perspectives." *Journal of Cleaner Production*, Decision-support models and tools for helping to make real progress to more sustainable societies, 105 (October): 41–51. <https://doi.org/10.1016/j.jclepro.2014.09.051>.

- SPW Agriculture. 2018. "Evolution de l'économie Agricole et Horticole de La Wallonie 2018." Namur, Belgique: SPW Agriculture. [www.agriculture.be](http://www.agriculture.be).
- Statbel. 2019. "Budget Des Ménages." *Statbel* (blog). November 28, 2019. <https://statbel.fgov.be/fr/themes/menages/budget-des-menages>.
- Steen, Bengt, and Sara Palander. 2016. "A Selection of Safeguard Subjects and State Indicators for Sustainability Assessments." *The International Journal of Life Cycle Assessment* 21 (6): 861–74. <https://doi.org/10.1007/s11367-016-1052-6>.
- Stiglitz, Joseph E., Amartya Sen, and Jean-Paul Fitoussi. 2009. "Rapport de La Commission Sur La Mesure Des Performances Économiques et Du Progrès Social." <http://www.ladocumentationfrancaise.fr/var/storage/rapports-publics/094000427.pdf>.
- Subramanian, Samanth. 2019. "Is Fair Trade Finished?" *The Guardian*, July 23, 2019, sec. Business. <https://www.theguardian.com/business/2019/jul/23/fairtrade-ethical-certification-supermarkets-sainsburys>.
- Sureau, Solène. 2014. "Entre Food Miles et Circuits Courts : Essai de Comparaison Des Circuits de Distribution Du Bio En Belgique à Partir d'une Analyse de Cycle de Vie de Légumes Wallons Du Champ à l'étal." Master's thesis, Brussels, Belgium: Université Libre de Bruxelles. [http://mem-envi.ulb.ac.be/Memoires\\_en\\_pdf/MFE\\_13\\_14/MFE\\_Sureau\\_13\\_14.pdf](http://mem-envi.ulb.ac.be/Memoires_en_pdf/MFE_13_14/MFE_Sureau_13_14.pdf).
- Sureau, Solène, and Wouter M. J. Achten. 2018. "Including Governance and Economic Aspects to Assess and Explain Social Impacts: A Methodological Proposal for S-LCA." In *Social LCA, People and Places for Partnership - 6th Social LCA Conference*. Fruitrop Thema. Pescara, Italy. <https://www.fruitrop.com/en/media/Publications/FruiTrop-Thema/Social-LCA-volume-4-6th-SocSem>.
- Sureau, Solène, François Lohest, Joris Van Mol, Tom Bauler, and Wouter M. J. Achten. 2019a. "How Do Chain Governance and Fair Trade Matter? A S-LCA Methodological Proposal Applied to Food Products from Belgian Alternative Chains (Part 2)." *Resources* 8 (3): 145. <https://doi.org/10.3390/resources8030145>.
- . 2019b. "Participation in S-LCA: A Methodological Proposal Applied to Belgian Alternative Food Chains (Part 1)." *Resources* 8 (4): 160. <https://doi.org/10.3390/resources8040160>.
- Sureau, Solène, Bernard Mazijn, and Wouter M. J. Achten. 2016. "How Assessment Criteria and Indicators Are Defined and Selected in Social LCA: A Literature Review." In *Book of Abstracts SLCA 2016*. Harvard, Cambridge, USA. <https://slca2016.splashthat.com/>.
- Sureau, Solène, Bernard Mazijn, Sara Russo Garrido, and Wouter M. J. Achten. 2017. "Social Life-Cycle Assessment Frameworks: A Review of Criteria and Indicators Proposed to Assess Social and Socioeconomic Impacts." *The International Journal of Life Cycle Assessment*, June, 1–17. <https://doi.org/10.1007/s11367-017-1336-5>.
- Sureau, Solène, Sabrina S. N. Neugebauer, and Wouter Achten. 2019. "Different paths in social life cycle impact assessment (S-LCIA) – a classification of Type II or impact pathways approaches." *The international journal of life cycle assessment*, September. <http://hdl.handle.net.ezproxy.ulb.ac.be/2013/>.
- Syndilait et CNIEL. 2017. "Les Laits de Consommation - Bilan 2016." Presented at the Assemblée générale, Paris, France, May 16. <http://iplc.fr/content/download/378/5388/version/2/file/2017-Plaquette+statistique.pdf>.
- Tecco, Nadia, Claudio Baudino, Vincenzo Girgenti, and Cristiana Peano. 2016. "Innovation Strategies in a Fruit Growers Association Impacts Assessment by Using Combined LCA and S-LCA Methodologies." *Science of The Total Environment* 568 (October): 253–62. <https://doi.org/10.1016/j.scitotenv.2016.05.203>.
- Timmermans, Ilse, and Luc Van Bellegem. 2018. "De biologische landbouw in Vlaanderen. Stand van zaken 2017." Brussels, Belgium: Departement Landbouw & Visserij. <https://lv.vlaanderen.be/nl/voorlichting-info/publicaties-cijfers/studies/sectoren/de-biologische-landbouw-vlaanderen-stand-van>.
- Touceda, Maria Isabel, Francisco Javier Neila, and Marc Degrez. 2016. "Modeling Socioeconomic Pathways to Assess Sustainability: A Tailored Development for Housing Retrofit." *The*



- International Journal of Life Cycle Assessment*, September, 1–16. <https://doi.org/10.1007/s11367-016-1194-6>.
- Trecolle, Emmanuelle, and Rémi Banet. 2019. “‘1 agriculteur sur 3’ gagne ‘moins de 350€ par mois’? L’estimation date de 2016 et n’est pas un indicateur complet.” *Factuel*, November 20, 2019. <https://factuel.afp.com/1-agriculteur-sur-3-gagne-moins-de-350eu-par-mois-lestimation-date-de-2016-et-nest-pas-un-indicateur>.
- Tregear, Angela. 2011. “Progressing Knowledge in Alternative and Local Food Networks: Critical Reflections and a Research Agenda.” *Journal of Rural Studies*, Subjecting the Objective—Participation, Sustainability and Agroecological Research, 27 (4): 419–30. <https://doi.org/10.1016/j.jrurstud.2011.06.003>.
- UN. 2002. “Plan of Implementation of the World Summit on Sustainable Development.” Johannesburg, South Africa: United Nations. [https://wedocs.unep.org/bitstream/handle/20.500.11822/19097/Johannesburg\\_Plan\\_of\\_Action.pdf?sequence=1&isAllowed=y](https://wedocs.unep.org/bitstream/handle/20.500.11822/19097/Johannesburg_Plan_of_Action.pdf?sequence=1&isAllowed=y).
- . n.d. “About the Sustainable Development Goals.” United Nations Sustainable Development. Accessed September 2, 2019. <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>.
- UNCED. 1992a. “Agenda 21.” UN Conference on Environment and Development. <https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf>.
- . 1992b. “The Rio Declaration on Environment and Development.” UN Conference on Environment and Development. [http://www.unesco.org/education/pdf/RIO\\_E.PDF](http://www.unesco.org/education/pdf/RIO_E.PDF).
- UNEP. 2017. “Sustainable Consumption and Production Policies.” United Nations Environment Programme. October 2, 2017. <http://www.unenvironment.org/explore-topics/resource-efficiency/what-we-do/sustainable-consumption-and-production-policies>.
- Valdivia, Sonia, Cassia M. L. Ugaya, Jutta Hildenbrand, Marzia Traverso, Bernard Mazijn, and Guido Sonnemann. 2013. “A UNEP/SETAC Approach towards a Life Cycle Sustainability Assessment—Our Contribution to Rio+20.” *The International Journal of Life Cycle Assessment* 18 (9): 1673–85. <https://doi.org/10.1007/s11367-012-0529-1>.
- Valdivia, Sonia, Cássia Maria Lie Ugaya, Guido Sonnemann, and Jutta Hildenbrand. 2011. “Towards a Life Cycle Sustainability Assessment: Making Informed Choices on Products.” UNEP/SETAC.
- Vallet, Cédric. 2014. “Travail saisonnier et exploitation : les pommes de discorde.” *Alter Echos*. November 25, 2014. <https://www.alterechos.be/travail-saisonnier-et-exploitation-les-pommes-de-discorde>.
- Van Calker, Klaas J., Paul B. M. Berentsen, Gerard W. J. Giesen, and Ruud B. M. Huirne. 2005. “Identifying and Ranking Attributes That Determine Sustainability in Dutch Dairy Farming.” *Agriculture and Human Values* 22 (1): 53–63. <https://doi.org/10.1007/s10460-004-7230-3>.
- Vanclay, Frank. 2002. “Conceptualising Social Impacts.” *Environmental Impact Assessment Review* 22 (3): 183–211. [https://doi.org/10.1016/S0195-9255\(01\)00105-6](https://doi.org/10.1016/S0195-9255(01)00105-6).
- Velden, Natascha M. van der, and Joost G. Vogtländer. 2017. “Monetisation of External Socio-Economic Costs of Industrial Production: A Social-LCA-Based Case of Clothing Production.” *Journal of Cleaner Production* 153 (June): 320–30. <https://doi.org/10.1016/j.jclepro.2017.03.161>.
- Veldhuizen, L. J. L., P. B. M. Berentsen, E. A. M. Bokkers, and I. J. M. de Boer. 2015. “Social Sustainability of Cod and Haddock Fisheries in the Northeast Atlantic: What Issues Are Important?” *Journal of Cleaner Production* 94: 76–85. <https://doi.org/10.1016/j.jclepro.2015.01.078>.
- Verbeke, Paul. 2012. “Beknopt Marktoverzicht Voor Biologische Groenten in Vlaanderen En Europa.” Antwerp, Belgium: BioForum Vlaanderen. <http://www.bioforumvlaanderen.be/sites/default/files/121105MSbiogroentendeel1.pdf>.
- . 2014. “Overzicht van de Europese Markt Voor Biologische Melk.” Antwerp, Belgium: BioForum Vlaanderen.
- . 2015. “Beknopt Marktoverzicht Voor Biologische Groenten in Vlaanderen En Europa.” Antwerp, Belgium: BioForum Vlaanderen.

- Vercauteren, Lieve. 2006. "Biomelk Vlaanderen - Case Study Report." SUS-CHAIN QLK5-CT-2002-01349. Marketing Sustainable Agriculture: An Analysis of the Potential Role of New Food Supply Chains in Sustainable Rural Development. Leuven, Belgium: Vredeseilanden. <https://www.sus-chain.org/results/index.htm><https://www.sus-chain.org/results/index.htm>.
- Vinyes, Elisabet, Jordi Oliver-Solà, Cassia Ugaya, Joan Rieradevall, and Carles M. Gasol. 2012. "Application of LCSA to Used Cooking Oil Waste Management." *The International Journal of Life Cycle Assessment* 18 (2): 445–55. <https://doi.org/10.1007/s11367-012-0482-z>.
- Vogtländer, Joost G., Han C. Brezet, and Charles F. Hendriks. 2001. "The Virtual Eco-Costs '99 A Single LCA-Based Indicator for Sustainability and the Eco-Costs-Value Ratio (EVR) Model for Economic Allocation." *The International Journal of Life Cycle Assessment* 6 (3): 157–66. <https://doi.org/10.1007/BF02978734>.
- VRT. 2018. "Wilt u 10 cent meer betalen voor uw groenten en fruit?" <https://www.vrt.be/vrtnws/nl/2018/04/11/pano--wil-u-10-cent-meer-betalen-voor-uw-groenten-en-fruit-/>.
- Wangel, Arne. 2014. "SLCA Scenarios: Engaging Producers and Consumers in New Domestic Oyster Value Chains in Denmark." In *Social LCA in Progress - 4th SocSem*. Fruitrop Thema. Montpellier, France: CIRAD.
- . 2018. "Back to Basics—the School Lunch." *The International Journal of Life Cycle Assessment* 23 (3): 683–89. <https://doi.org/10.1007/s11367-016-1110-0>.
- WCED. 1987. "Our Common Future." World Commission on Environment and Development. [http://www.diplomatie.gouv.fr/fr/sites/odyssee-developpement-durable/files/5/rapport\\_brundtland.pdf](http://www.diplomatie.gouv.fr/fr/sites/odyssee-developpement-durable/files/5/rapport_brundtland.pdf).
- Weidema, Bo P. 2006. "The Integration of Economic and Social Aspects in Life Cycle Impact Assessment." *The International Journal of Life Cycle Assessment* 11 (1): 89–96. <https://doi.org/10.1065/lca2006.04.016>.
- . 2018a. "The Social Footprint—a Practical Approach to Comprehensive and Consistent Social LCA." *The International Journal of Life Cycle Assessment* 23 (3): 700–709. <https://doi.org/10.1007/s11367-016-1172-z>.
- . 2018b. "Towards a Taxonomy for Social Impact Pathway Indicators." In *Pre-Proceedings*. Fruitrop Thema. Pescara, Italy: CIRAD.
- Weingarten, Debbie. 2018. "Why Are America's Farmers Killing Themselves?" *The Guardian*, December 11, 2018, sec. US news. <https://www.theguardian.com/us-news/2017/dec/06/why-are-americas-farmers-killing-themselves-in-record-numbers>.
- WFTO. 2015. "History of Fair Trade." World Fair Trade Organization. 2015. <https://wfto.com/about-us/history-wfto/history-fair-trade>.
- WFTO-Europe. 2018. "Northern Producers within WFTO." Factsheet. Brussels, Belgium: World Fair Trade Organization - Europe. [https://wfto-europe.org/wp-content/uploads/2018/04/Factsheet\\_NorthernProducersWithinWFTO\\_Apr20182.pdf](https://wfto-europe.org/wp-content/uploads/2018/04/Factsheet_NorthernProducersWithinWFTO_Apr20182.pdf).
- Wiedmann, Thomas, and Manfred Lenzen. 2018. "Environmental and Social Footprints of International Trade." *Nature Geoscience* 11 (5): 314–21. <https://doi.org/10.1038/s41561-018-0113-9>.
- Wilshaw, Rachel. 2010. "Better Jobs in Better Supply Chains." Briefing for business 5. Oxford, UK: Oxfam International. <https://policy-practice.oxfam.org.uk/publications/better-jobs-in-better-supply-chains-114001>.
- Winandy, Stéphane, and Samuel Comps. 2012. "Table Ronde Organisée Par Le CRA-W Sur Le Thème de La « ferme Du Futur »: Evolution Des Habitudes de Consommation." [http://www.cra.wallonie.be/img/page/Conference/table%20ronde/OCA\\_texte\\_libramont2012.pdf](http://www.cra.wallonie.be/img/page/Conference/table%20ronde/OCA_texte_libramont2012.pdf).
- Wood, Richard, and Edgar G. Hertwich. 2013. "Economic Modelling and Indicators in Life Cycle Sustainability Assessment." *The International Journal of Life Cycle Assessment* 18 (9): 1710–21. <https://doi.org/10.1007/s11367-012-0463-2>.
- World Bank. n.d. "World Bank Open Data." Accessed January 21, 2020. <https://data.worldbank.org/>.

- World Fair Trade Organization, and Fairtrade International. 2018. "The International Fair Trade Charter." <https://www.fair-trade.website>.
- Wu, Ruqun, Dan Yang, and Jiquan Chen. 2014. "Social Life Cycle Assessment Revisited." *Sustainability* 6 (7): 4200–4226. <https://doi.org/10.3390/su6074200>.
- Wu, Susie Ruqun, Jiquan Chen, Defne Apul, Peilei Fan, Yanfa Yan, Yi Fan, and Peiling Zhou. 2015. "Causality in Social Life Cycle Impact Assessment (SLCIA)." *The International Journal of Life Cycle Assessment* 20 (9): 1312–23. <https://doi.org/10.1007/s11367-015-0915-6>.
- WUR. 2019. "'True and Fair Price' Study Begins." *Wageningen University and Research* (blog). January 24, 2019. <https://www.wur.nl/en/newsarticle/True-and-Fair-Price-study-begins.htm>.
- Zaccaï, Edwin, and Isabelle Haynes. 2008. *La société de consommation face aux défis écologiques*. Problèmes politiques et sociaux 954. Paris: La documentation française.
- Zamagni, Alessandra. 2012. "Life Cycle Sustainability Assessment." *The International Journal of Life Cycle Assessment* 17 (4): 373–76. <https://doi.org/10.1007/s11367-012-0389-8>.