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How Do Chain Governance and Fair Trade Matter? A S-LCA Methodological Proposal Applied to Food Products from Belgian Alternative Chains (Part 2)

Solène Sureau *, François Lohest, Joris Van Mol, Tom Bauler and Wouter M. J. Achten *

Institute for Environnemental Management and Land-Use Planning (IGEAT), Université Libre de Bruxelles, Av. F. D. Roosevelt, 50, B-1050 Brussels, Belgium

* Correspondence: ssureau@ulb.ac.be (S.S.); wachten@ulb.ac.be (W.M.J.A.)

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Abstract: Alternative food networks (AFNs) have emerged to improve both environmental and socio-economic aspects of food provisioning, including the living and working conditions of farmers. Their objectives are supposed to be mediated through the shortening of chains and/or the implication of alternative value chain actors (VCAs). Through the application of a social life cycle assessment methodological proposal on two products from three Belgian AFNs, we first verify how the AFNs meet sustainability promises. Second, we investigate how such social sustainability of the assessed products is influenced by the differentiated configurations of chain governance in the AFNs. Such a discussion of root causes of social sustainability performances in product chains have been investigated very little as of yet. Our results show that AFN perform well in some aspects (consumer aspects, work satisfaction, social ties between VCAs), but in some others, AFN chains use similar mechanisms as the ones used by mainstream chains (unbalanced market power, unfair prices, and low commitment between VCAs), with potentially detrimental effects on profitability and employment conditions for VCAs located upstream, i.e., farms. Our framework is useful to highlight social hotspots in product chains, and to discuss these across the differences in the configurations of the chain layout and—in the end—chain governance.

Keywords: S-LCA; Social LCA; social life-cycle assessment/analysis; alternative food networks; short food chains; product chain governance; social impacts/performances of product chains; transaction modalities; fair trade; buying practices

1. Introduction

1.1. Social Sustainability Issues in Food Chains: A Sector with High Risks for Farms and Their Workers

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. Non-standard employment, vulnerable employment and informal employment are mostly found in agriculture, given the sector's specificities, such as seasonal fluctuations in workforce needs, or the volatility of commodity prices [1,2]. In developing countries, the agricultural sector is the main job provider and 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" [3].

Although the agricultural labor force is much smaller in northern countries, agriculture stands as a sector with especially poor working conditions, in comparison to other sectors. Stable contracts

are rare, with more than half of the workers being self-employed (versus 15% on average), fixed contracts less prevalent and a larger percentage of employees not having a contract (12.5% versus 4.7% on average) [4]. Also, "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" [4]. Finally, a substantial percentage of farmers are "poor workers," and between farms, there are big inequalities in terms of income, with "20% of the labor force generat[ing] 78% of the [Family farm income]" [5]. Exact figures are rare, but in the beginning of the 2000s, 31% of Belgian farm households earned less than a poverty threshold of €20,000 [6]. In France, a recent figure shows that 30% of French farmers earns less than €354 a month [7]. Farms facing income issues are generally small and mixed farms, big cereals farms having the highest incomes [5]. These figures do not take into account the high number of work hours per farmer: In France, farmers work 15% more than a craftsperson, and 35% more than an employee [8]. At the EU level, "The agricultural sector stands out as having the highest proportion of workers performing an excessive number of working hours" [2]. While these first-order socio-economic issues (e.g., revenue, working conditions) start to be relatively well documented, one objective of the present paper is to expand beyond and embrace the multi-dimensional and multi-actor reality of social sustainability issues and challenges in the food chains.

1.2. Alternative Food Networks as Responses to Food Chain Issues or How Chain Governance Could Matter

Community-supported agriculture, farmer's markets and producer and consumer co-op (or what are generally called alternative food networks (AFNs)) have been developed to reduce environmental impacts, but also to offer healthier food for consumers and to provide 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 [9]. It is thus believed that cutting down intermediaries or going through alternative actors will benefit farmers, and overall the social sustainability of products [10]. 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 [11]. 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 [12,13] and from GCC and related branch's research works [14–16], 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" [17]. The present paper intends to develop a discussion of the role of food chain governance arrangements in co-determining aspects of social sustainability. In particular, the paper 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.

As a tool designed to assess social impacts of a product's life cycle, the practice of Social Life Cycle Assessment (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 [18,19] (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) [20].

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 [21]. 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 [22]. 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 [23]; but also within GCC analysis and related branches, which focuses on firms of production networks, but less on workers [24]. With this case study, we propose to bridge both approaches, building on the few GCC studies [14–16] and LCA studies [21] 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 [25].

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. This S-LCA framework was built within a participatory action research project gathering chain actors of the three Belgian AFNs assessed in this paper and its building is described in the first part of this article [26]. One of our objectives was thus also to test with this case study the applicability of the new methodological 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. An extensive review of studies analyzing CSAs in the US and Canada highlights the "financial problems to be worked out" in CSAs, though CSA farmers seem to come out ahead when comparing them with farmers using conventional chains [27] (p. 1300). Galt (2013) talks about "self-exploitation" of CSA farmers in the US, because of their "strong sense of obligation to their members" [28] (p. 341). 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 [29].

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) [20].

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 Methods

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). This methodology comes from a specific methodological proposal described in a previous paper [30], and whose main steps are summed up in Figure 1.

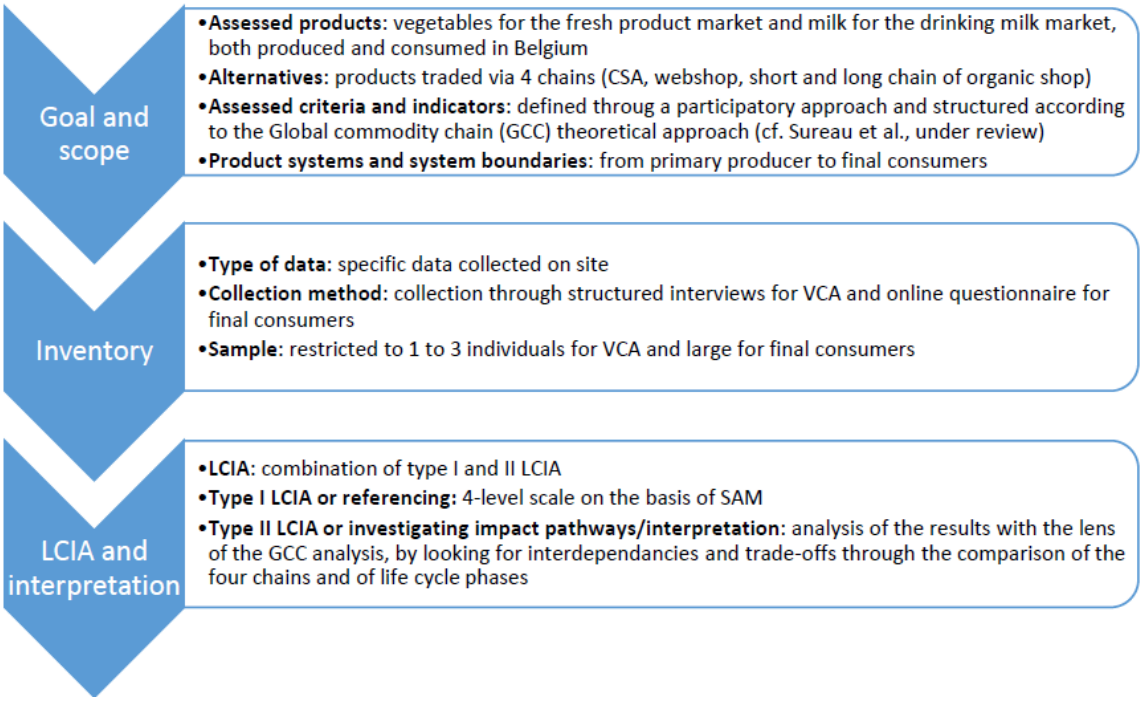


Figure 1. Methodological steps and choices.

2.1. Goal and Scope: Assessed Products, Alternatives, Assessed Criteria and Indicators, Product Systems and System Boundaries

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.

In terms of assessed criteria and indicators, we use a specific framework presented in the first part of this article [26], 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, 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., fairness between VCAs 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 A1 (Appendix A). It regards chain and VCA governance, VCA, workers and final consumers.

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 Figures 2 and 3).

Mainstream chains for local organic food products (including fresh vegetables and drinking milk) function similarly to chains for local conventional products [31]. They start from supermarkets, which are the first channel both for conventional and organic segments, though less dominant for the latter [32]. 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).

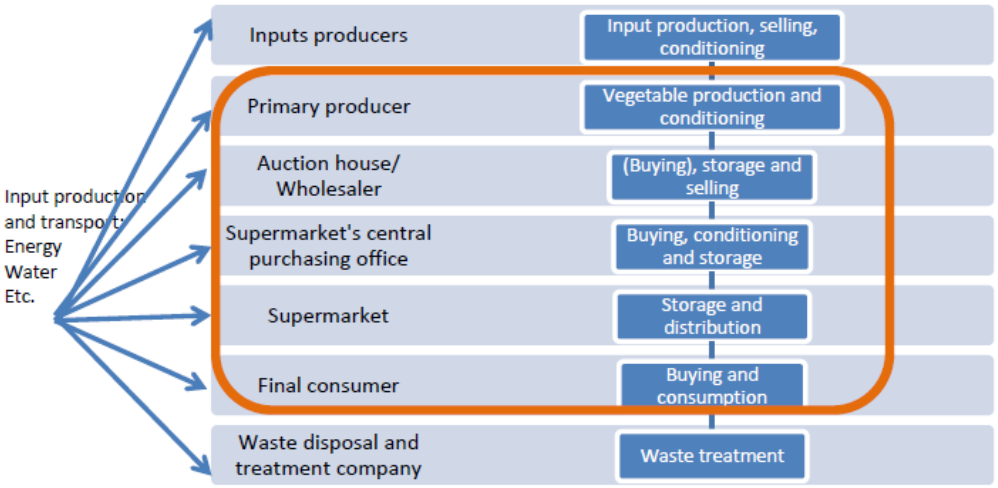


Figure 2. Mainstream product system for fresh vegetables. The orange line indicates the system boundaries of the study.

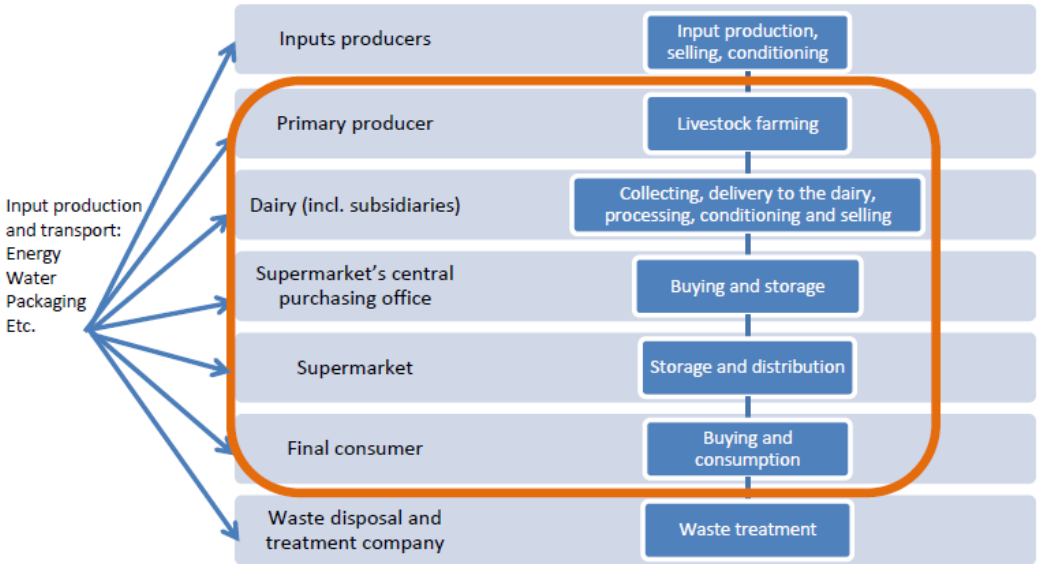


Figure 3. Mainstream product system for drinking milk. The orange line indicated the system boundaries of the study.

In Figures 4 and 5 (and subfigures a–d), we present the product systems of our alternatives. In the Figures 4a and 5a CSA system, 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 Figures 4b and 5b webshop system 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.

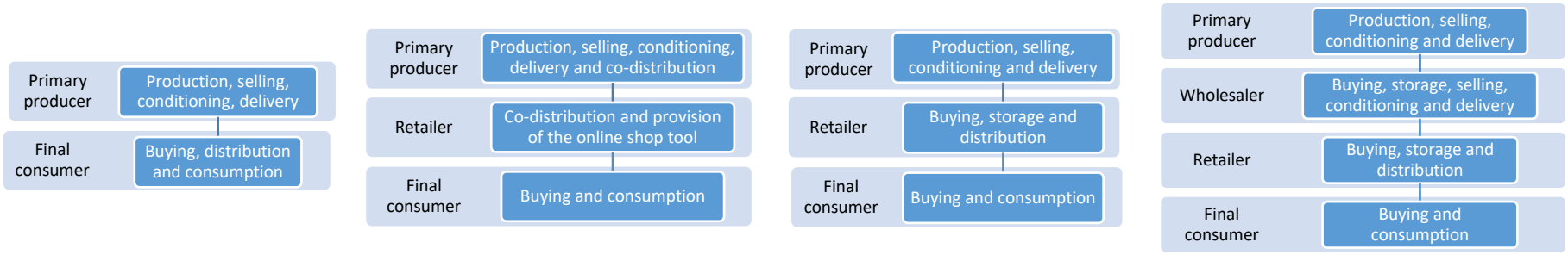
The organic shop is a chain of three shops in 2016, but with the ambition to expand significantly in the coming years. The organic shop operates as a classical supermarket but sells organic products only and favors local products. For the organic shop, we assess two chains by product: For vegetables, a short chain Figure 4c where the primary producer sells directly to the shop, and a longer one Figure 4d where a wholesaler takes part; for drinking milk, a short chain Figure 5c where the drinking milk is processed on farm, and a longer one Figure 5dwhere it is processed in a dairy.

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

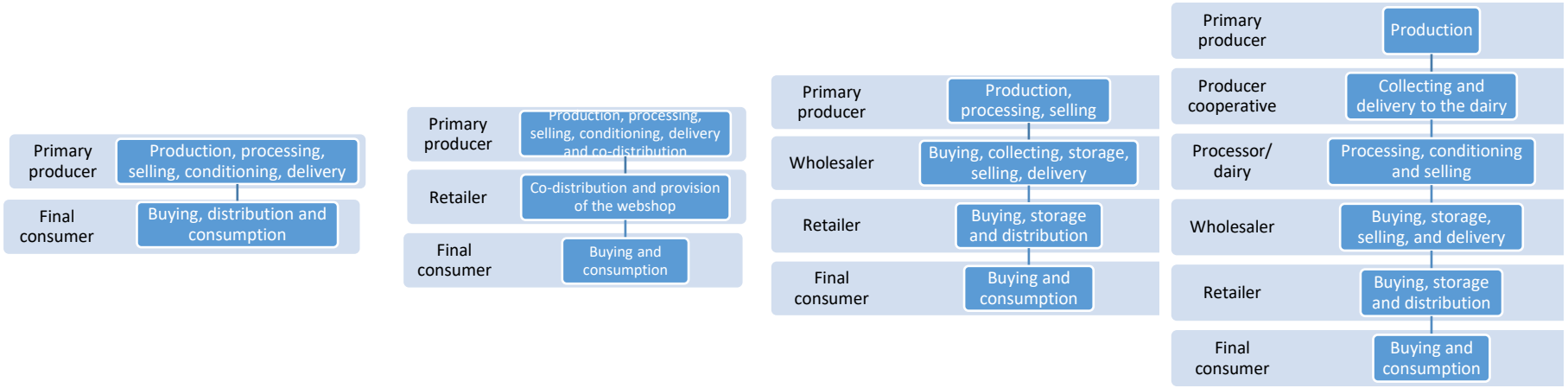
Specific data or data collected on-site was used for all processes included in the system boundary. In fact, information on supply chains is in general poor, and S-LCA can be used as an empirical tool to gather information on product supply chains. Generic data was used to interpret results, and for 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.



(**a**) CSA (**b**) Webshop of local products (**c**) Organic shop short chain (**d**) Organic shop long chain

Figure 4. Product systems of the 4 alternatives for fresh vegetables. (**a**) CSA; (**b**) Webshop of local products; (**c**) Organic shop short chain; (**d**) Organic shop long chain.



(**a**) CSA. (**b**) Webshop of local products. (**c**) Organic shop short chain. (**d**) Organic shop long chain.

Figure 5. Product systems of the four alternatives for drinking milk. (**a**) CSA; (**b**) Webshop of local products; (**c**) Organic shop short chain; (**d**) Organic shop long chain.

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 [30]. 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) for details and rationale [30]).

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) [33], 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 [10,34], including: Democratization and fair trade, better social ties and profitability, better employment and working conditions, better product quality, accessibility and consumer education.

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 Assessment: Reporting on Social Hotspots at Different Levels of the AFNs' Chains

The results are composed of four parts: (i) The relations between VCAs or how the chain is governed and what the transaction modalities are, (ii) what the sustainability performances are relating to (iii) VCA, (iv) workers and (v) final consumers. For the first part, performances of mainstream chains are presented before the performance of the AFNs.

3.1. Chain Governance and Relations between VCAs 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. last lines of Tables 1 and 2, Figures 2 and 3). 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 [35] (46% for organic products in 2017 [36]). 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 [32,37] and the number of dairy collectors from 95 in 1976 to 15 in 2014 [35,38]. At the same time, in the dairy industry, dairy co-ops became complex structures, with a subsidiarization phenomenon [39]. 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 [40,41].

Table 1. Results regarding 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 Tables A2 and A3, in Appendix B): 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 [31]. In the case of conventional vegetables, farmers do not even know in advance the selling price [32]. 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. 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, more than half of the milk is collected by

one private dairy. Farmers generally have contracts, but the dairy imposes a "unilateral control on volumes and prices" [42] (pp. 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 2. Results regarding chain and VCA governance of drinking milk chains.

Criteria	Farm	Co-op	Processor	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	C					(c) Organic shop short 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					(d) Organic shop long chain
Level of control 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
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	

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 basket 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 basket 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 basket; 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. Figures 4 and 5, 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 (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" [43]). 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 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.

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 in 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 or the Promise of Better Social Relationships and Profitability

As depicted in Tables A4 and A5, 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 2015–2017 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) [44]. 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. Tables A6 and A7). 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 [45].

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. Tables A8 and A9), 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 h a week. This is well above the European average of 46 h per week [4]. 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 Better Access to Quality Products and Consumer Education

As presented in Table A10, 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 Assessment: 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 Management and 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 [40]. 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 [46]. 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 6.

Figure 6. 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" [47]. 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 [48]. 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. 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. (The criteria "Stability of trading relationship"

was included in our framework (cf. part 1 of this article) [2]; however, we could not assess it in this case study.) 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.

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/referencing 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 [20], 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., [14]. However, the access to such sensitive data as transaction modalities and profitability on a large scale is unlikely.

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Appendix A

Table A1. 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 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 known 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
	Price fairness	Pricing mechanism (1): Who sets the price?	B. The supplier C. The price is negotiated D. The buyer
		(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
	Unfair trade practices	Payment term	A. Within 7 days B. Within 30 days C. Within 3 months D. After 3 months
		Social Ties Felt by VCA	
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 >= 4 B. 3 =< x < 4 C. 2 =< x < 3 D. x < 2
	Recognition between VCA	Whether the supplier feels recognized and valued for his/her work by the client	
	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)

Table A1. *Cont.*

	Criteria	Indicators	Reference Points
		Employment conditions	
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
		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
		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	A. x >= 4 B. 3 =< x < 4 C. 2 =< x < 3 D. x < 2
		Concerns of workers regarding potential future occupational health problems	
	Work satisfaction	Feeling of workers on general satisfaction, autonomy, learning, relations with supervisor and colleagues, work recognition, work-life balance and pay	
		Product's Quality and Transparency	
Final consumers	Food safety	Trust of consumers regarding food safety	A. x >= 4 B. 3 =< x < 4 C. 2 =< x < 3 D. x < 2
	Taste	Satisfaction of consumers regarding taste quality	
	Product's transparency	Satisfaction of consumers regarding the information provided on the product and on production methods	
		Product's accessibility	
	Product's affordability	Satisfaction about product affordability	A. x >= 4 B. 3 =< x < 4 C. 2 =< 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)
		Awareness raising on sustainability issues	
	Consumer education	Feeling of consumers regarding the evolution of their awareness on sustainability issues, since they buy the product through the channel	A. x >= 4 B. 3 =< x < 4 C. 2 =< x < 3 D. x < 2

Appendix B

Table A2. 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		D	Web-shop
Who sets the price?	B			
On which basis?	B			
Payment term	A		A	
Commitment between VCA	D		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	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	D	Mainstream chain
Who sets the price?	D	D	B	
On which basis?	D	B	B	
Payment term	B	C/D	A	

Table A3. 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				D	Web-shop
Who sets the price?	B					
On which basis?	B					
Payment term	A				A	
Commitment between VCA	D			D	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	B		B		D	Mainstream chain
Who sets the price?	D		C		B	
On which basis?	C		B		B	
Payment term	B		C/D		A	

Table A4. 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 short chain
Felt recognition	5		3	
Felt understanding	5		2	
Trust in the trade relationship	4	3	Nap	Organic shop long chain
Felt recognition	5	2	3	
Felt understanding	3	2	2	

Table A5. 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 A6. 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	

Table A6. *Cont.*

Criteria/Indicator	Farm	Wholesaler	Retailer	Chains
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)	C (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 A7. 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 A8. 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 A9. 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 A10. 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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