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# Sustainability Assessment Framework for Food Supply Chain Logistics: Empirical Findings from Dutch Food Industry

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## ABSTRACT

Food companies are increasingly challenged to balance business performance and economic gains with environmental and social performance. Therefore, in 2012, we started a collaborative project on this topic named SCALE (*Step Change in Agri-food Logistics Ecosystems*). SCALE aims to improve the sustainability of food and drink supply chain logistics in the context of rising food demands, increasing energy prices and the need to reduce environmentally damaging emissions. More in particular, SCALE aims to deliver a number of tools and frameworks valuable for the agri-food sector to secure a step change in operational practices, which will improve the efficiency and sustainability of supply chain logistics. In the paper we present the first results of this project. Aim of this paper is (1) to present a sustainability research framework for food supply chains logistics including drivers, strategies, performance indicators, metrics and improvement opportunities to measure and potentially enhance sustainability performances; and (2) to analyse and diagnose the current status of Dutch food & drinks companies and logistics service providers using this framework. Results are found via a literature review, web-based research and structured interviews with Dutch food and logistics service industry.

*Keywords: Food logistics, sustainability, food industry, logistics service providers*

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## 1 Introduction

Population growth, alterations in our overall nutritional status and rising economic incomes have all contributed to a significant increase in global consumption of food (Tilman et al., 2002). This increased consumption has consequently increased the demand, production and distribution of food worldwide leading to severe global economic, social and environmental problems in the world as well (Tilman et al., 2002). Food sectors require increased production while simultaneously demanding a decrease in the negative impact of this production (FAO, 2012). In this context, sustainability has emerged as an essential agenda for our entire society. As noted by Baldwin, "Sustainable development has been defined as meeting the needs of the present without compromising the ability of future generations to meet their needs" (Baldwin, 2009, p. xiii). Food companies are increasingly challenged to balance business performance and economic gains with environmental and social issues.

To help decision-makers select from among various sustainable improvement steps, a comprehensive assessment regarding the *triple bottom-line* performance is needed. This Triple Bottom Line concept (TBL) concept was first used by Elkington (1994) and is explained as: "simultaneously considering and balancing economic, environmental and social goals from a business point of view." Craig et al. (2008) state that TBL suggests that at the intersection of social, environmental, and economic performance, there are activities that organizations can engage in, which not only positively affect the natural environment and society, but which also result in long-term economic benefits and competitive advantage for the firm. This engagement of activities is called *sustainable supply chain management* (SSCM). To elaborate, "SSCM is

the strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination of key interorganizational business processes for improving the long-term economic performance of the individual company and its supply chains (Craig et al., 2008)". A TBL assessment makes it possible to select (and design) food production chains that can reduce environmental degradation, economic instability and social insecurity. This not only refers to all forward processes in the chain, but also to the reverse processes to collect and process returned products in order to ensure socio-economically and ecologically sustainable recovery (Bloemhof and van Nunen, 2008).

According to FAO (2012) more than 100 countries have established national strategies for sustainable development, including sustainability targets and indicators. In spite of the abundant attempts for making food and agriculture sectors sustainable, no internationally accepted standard defines what 'sustainable food production' essentially requires. "Neither a commonly accepted set of indicators that have to be taken into account when measuring sustainability performance, nor widely accepted definitions of the minimum requirements that would allow a company to qualify as 'sustainable', exist" (FAO, 2012, p. 9). This is supported by Hassini et al. (2012) who conducted an extended literature review of more than 700 papers on sustainability performance metrics of the last decade (2000-2010). They identified, amongst others, the following challenges:

- There are many environmental indicators, but which to use, when and how?
- Some environmental measures are linked to clear governmental regulations, many economic and social measures are not and it is usually hard to enforce compliance throughout the supply chain.
- Different (types of) SC players with, potentially conflicting, strategies have to agree on which metrics to use, with which data and deal with confidentiality issues.
- Due to the dynamic nature of supply chains, required measures change in time. Furthermore, companies might have different roles in different chains requiring management on different performance indicators at the same time.

The aforementioned gaps necessitate the definition of a state of the art framework for sustainability supply chain assessment.

In 2012, we started a collaborative international project on this topic named SCALE (*Step Change in Agri-food Logistics Ecosystems*). SCALE aims to improve the sustainability of food and drink supply chain logistics in the context of rising food demands, increasing energy prices and the need to reduce environmentally damaging emissions. More in particular, SCALE aims to deliver a number of tools and frameworks valuable for the agri-food sector to secure a step change in operational practices, which will improve the efficiency and sustainability of supply chain logistics. This paper contributes to the SCALE-project, because it aims to develop a sustainability framework to measure and potentially enhance sustainability performances of food supply chain logistics. Aim of this paper is (1) to present a sustainability research framework for food supply chains logistics including drivers, strategies, performance indicators, metrics and improvement opportunities to measure and potentially enhance sustainability performances; and (2) to analyse and diagnose the current status of Dutch food & drinks companies and logistics service providers using this framework. Results are found via a literature review, web-based research and structured interviews with Dutch food industry and logistics service industry.

The remainder of this paper is as follows. Section 2 introduces our sustainability assessment framework, specifically for food supply chain logistics, to propose a structured and rational method for assessing sustainability. Next, Section 3 and 4 describe findings from practice where we specify the elements of the sustainability assessment framework, based upon explorative web-based research and structured interviews with best practice players in the field respectively, resulting in an overview of barriers for sustainability improvement. We end this paper with conclusions and further research opportunities.

## **2 Sustainability assessment framework for food supply chain logistics**

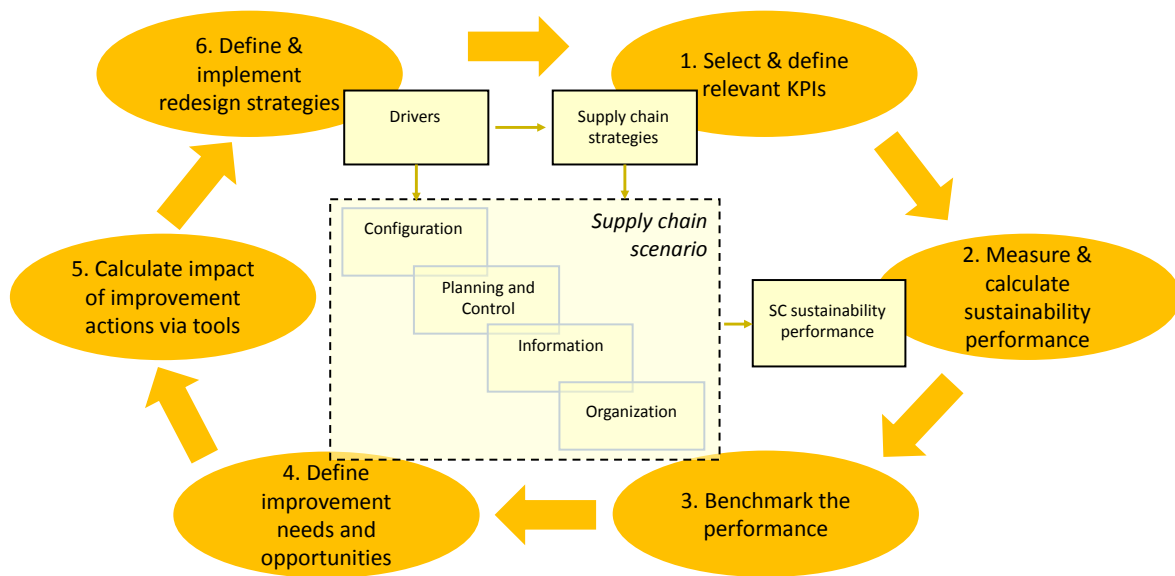
Literature suggests several strategic, tactical, and operational redesign strategies to improve the efficiency and effectiveness of food supply chain processes (Van der Vorst and Beulens, 2002). Up to recently, this related foremost to the improvement of process efficiency (hence minimisation of costs) and customer service levels. Now, the TBL concept evokes the need for an integrated approach that links supply chain design decisions to all three pillars (economic, environmental and social pillars) of sustainability (Chaabane et al., 2012). This is supported by the literature review of Tang and Zhou (2012), who indicate that there is a need to fill the gap between practice and theory; i.e. to integrate sustainability issues with traditional performance indicators as costs, responsiveness and product quality. Or as Van der Vorst et al. (2009) state, investments in food supply chain design should not only be aimed at improving logistics performance, but also at the preservation of food quality and environmental sustainability.

Figure 1 presents an overview of our sustainability assessment framework for food chain logistics; a framework that can be used to redesign the supply chain resulting in improved overall performance. Each of the elements and, successively, the steps of the framework will now briefly be presented. Further, we will discuss the findings on each of the elements and steps in practice.

*Core elements of the framework*

The framework departs with (see the centre of the figure) the definition of the supply chain under study, including the chain sustainability strategy, related performance indicators and drivers for sustainability. It is obvious that different organizations strive for different goals, hence formulate different strategies. The degree of sustainability involvement and the choice for certain sustainability initiatives and improvement opportunities depend on the strategy of a company. Hagelaar et al. (2002) present three different sustainability strategies, namely;

- *Compliance-oriented strategy*: aimed at compliance with rules and regulation; focus on end-of-pipe techniques to reduce negative output;
- *Process-oriented strategy*: a more pro-active approach based on the internal driver of pollution prevention pays (a better return) under the condition of compliance with rules and regulation. Focus is on process improvement, such as reduction of the use of raw materials and prevention of waste within the separate steps in the production process;
- *Market-oriented strategy*: a pro-active approach to brand sustainable performance to reach competitive advantage. Focus is on total reduction of the environmental burden caused by the design of the product, next to an optimal social and financial performance.



**Figure 1.** Sustainability assessment framework for food supply chain logistics.

The choice of the sustainability strategy is influenced by drivers. Lee and Klassen (2008) state that a driver is a factor that initiates and motivates firms to adopt (in this case) SSCM. There are internal drivers, i.e. drivers within a company that help to achieve sustainable practices, and external drivers, i.e. factors beyond the company’s boundaries and capabilities. Different strategies will result in different supply chain designs, or scenarios. In detail, a supply chain scenario can be described by four elements (van der Vorst and Beulens, 2002; Vlajic et al., 2012):

- *chain configuration*: the structure, facilities and means, the parties involved and the roles to be performed in the supply chain;
- *chain control structure*: the set of decision functions (located at multiple decision layers with different decision horizons) that govern the execution of operational activities aimed at realizing logistical objectives within the constraints set by the chain configuration and strategic objectives (e.g., delivery frequency, order acceptance policy, production planning structure, etc.);

- *chain information systems*: the systems (with their characteristics) that support decision making (enable information exchange and make data available) and/or are required to perform operations (e.g., EDI, ERP, APS, TMS, WMS, etc.);
- *chain organization and governance structures*, which assign tasks (along with the corresponding responsibilities and authorities) to organizations and persons in the supply chain.

Depending on the sustainability strategy chosen, specific sustainable transportation means or warehouses will be (or will not be) selected, decision support systems will incorporate the relevant sustainability criteria in decision making, information systems will gather and exchange sustainability data, and dedicated departments will be established responsible for improving sustainability.

### **Steps of the framework**

Our sustainability assessment framework comprises six steps, starting with the selection and definition of the relevant sustainability Key Performance Indicators (KPIs)—of course depending on the chosen strategy (step 1). KPIs can be used to measure whether targets have been realised in practice; KPIs refer to a relatively small number of critical dimensions, which contribute more than proportionally to the success or failure in the marketplace (Gunasekaran and Kobu, 2007). A well-defined set of supply chain KPIs will help establish benchmarks and assess changes over time. This is done respectively in step 2 (where the current performance is measured) and step 3 (where the performance is benchmarked). Step 4 defines improvement needs by comparing the current performance and the benchmark results, which can be aligned to available improvement options. According to Dekker et al. (2012), improvement options in sustainable logistics focus particularly on inventory, transportation and facility decisions. Subsequently, the chosen options are assessed in step 5 using sophisticated modeling tools. Note that Seuring (2013), based on an extended literature review on sustainability modeling approaches, states that it is important to develop alternative modeling approaches that support multi-dimensional trade-off calculations and identify win-win solutions. Finally, redesign strategies can be defined that – after implementation – improve the sustainability performance on the chosen indicators (step 6). After such an assessment, redesigns can be proposed, piloted and finally implemented if they turn out to be a successful business case. To emphasize, this conceptual sustainability framework provides a closed loop architecture for a constant evaluation and improvement opportunities identification for food logistics sustainability.

### **Application of the framework**

In the remainder of this paper, we apply parts of the framework on a number of companies in the Dutch food industry. More in particular, we present the drivers, strategies and KPIs that companies use, the improvement opportunities that have main attention in industry and, finally, barriers that companies experience in sustainability improvement. We use a qualitative methodology, combining explorative web-based research, desk analysis of sustainability reports and certificate programs and semi-structured interviews.

First, a web-based research was executed to gather generic information on the current situation in the food and drink industry. We selected the top 25 (highest turnover) Dutch food/drinks companies present in the Food Top 100 (Nyenrode Business University, 2012) and reviewed the corporate websites on sustainability information; 17 of them provided sufficient information for further analysis. Furthermore, we selected logistics service providers (LSPs) operating in the Dutch food and drinks supply chain and present in the TOP 50 of LSPs in 2012 provided by the magazine 'Logistiek' ([www.logistiek.nl](http://www.logistiek.nl)); 19 of them provided sufficient information on their corporate websites. Data was obtained by analysing the information on the corporate website and the company's sustainability report. Sustainability reports were provided by 11 of the 17 food industry companies and by six of the 19 LSPs. Specific attention was given to the key sustainability performance indicators reported.

Second, information on current sustainability certificates and universal measurement methods was gathered to identify industry-wide initiatives. After a thorough search on the internet, we selected and analysed four sustainability certificates used in the Netherlands to assess indicators and improvement options, being the *Lean and Green programme*, the *CO<sub>2</sub> performance ladder*, the *European certificate Green Freight Europe* and the *Green Care Transport*. For example, at the time of the analysis the *Lean and Green program* gave access to 250 front running companies that had initiated operational plans with measurable objectives to reduce their CO<sub>2</sub> emissions amount with 20% in five years.

Finally, semi-structured interviews were held with sustainability managers of companies, which were seen as front runners in the respective industries; three food companies and three LSPs were selected. The interviews were recorded, transcribed, and analyzed using ATLAS.

### 3 Web-based desk research results

Table 2 presents an overview of sustainability KPIs mentioned most in sustainability reports by Dutch food or drinks companies and LSPs, the number of companies that use these indicators and which 3BL sustainability dimension the indicators address. Results show that the planet dimension has most attention of industry, next to people indicators. Energy and water use as well as emissions have most attention from food industry; carbon footprints are central to LSPs. Interestingly, the profit dimension is hardly mentioned by all parties. Apparently this is not seen as a unit of sustainability!

A detailed analysis of the four sustainability certificates showed that all certificates focus especially on CO<sub>2</sub> emission reductions in road transport, but also give specific attention to reduction of waste and costs (due to sustainability improvements). Whereas the *Lean and Green programme* focuses purely on logistics, the *CO<sub>2</sub> performance ladder* focuses on all industries and tries to integrate the companies' suppliers as well. *Green Freight Europe* focuses on road transportation within Europe, whereas *Green Care Transport* has a global focus. All certificates provide an award or certification when a company participates in their initiative.

**Table 2.**  
Overview of key sustainability indicators mentioned by food companies

Food Industry			Logistic Service Provider		
Indicators	# /17	3BL	Indicators	# /19	3BL
Water use (m3)	11	Planet	CO2 emissions transport	5	Planet
Energy use	10	Planet	Fuel use	3	Planet
CO2 emissions (tonnes)	9	Planet	CO2 emissions facilities	3	Planet
Male-female ratio (% of total fte)	8	People	Trained employees (%)	3	People
Total waste production	7	Planet	Absenteeism (%)	3	People
Accidents (Freq. rate)	7	People	Absenteeism (total days)	3	People
Renewable energy (%)	6	Planet			
Recycling & recovery rate	6	Planet			
Absence (%)	6	People			
Trained employees ( hours/fte)	5	People			

In the Netherlands the *Lean and Green Award* has had major management attention. Over 250 'front running' companies initiated specific plans with measurable objectives to reduce their CO<sub>2</sub> emissions amount with 20% within five years. In total the participants mentioned 280 improvement opportunities for reducing CO<sub>2</sub> emissions in logistics. Table 3 provides an overall overview of these improvement options categorized to a prevalent term and to one of the four elements of a supply chain scenario. Most improvement opportunities (about 60%) mentioned by companies refer to the configuration level; 25% refers to planning and control, 10% to information system improvements and 5% to changes in the organisation. Of course this only refers to the frequency and not to the importance of each improvement opportunity (in specific cases)! The improvement opportunities at configuration level are mainly characterised as investments to optimise the internal infrastructure, whereas for planning and control and information systems most options require supply chain collaboration (indicated in table 3 as *italic* terms). It indicates that companies start with improving their own business first, before moving on to the supply chain. Collaboration between supply chains and its facilities are considered most as future options to further improve sustainability.

**Table 3.**  
Sustainability improvement options (*italic* = requires partner involvement)

<b>Configuration (60%)</b>	<b>Planning &amp; Control (25%)</b>	<b>Information (10%)</b>	<b>Organisation (5%)</b>
Green warehouse	Less material use	Fleet management systems	Create internal awareness
New truck, LZV	<i>Delivery adjustments</i>	(new) TMS	Change organisation
Vehicle adjustments	<i>Planning adjustments</i>	(new) WMS	structure (QSHE)
Fuel adjustments	<i>Supply adjustments</i>	<i>Info sharing with clients</i>	<i>Create external awareness</i>
Relocation sites	<i>Consolidation</i>		
New production equipment	<i>Collaboration</i>		
<i>Network redesign</i>	<i>Joint planning</i>		
<i>Packaging redesign</i>	<i>Client involvement</i>		
<i>Multi-modal network</i>			
<i>New supplier</i>			

## 4 Interview results

This section describes findings from practice where we specify elements of the sustainability assessment framework, based upon six structured interviews with best practice players in the field. We interviewed three multinational food companies of different subsectors; one in the soups & sauces sector (food company FC1), one in the meat sector (food company FC2) and one company in the fast moving consumer goods sector (food company FC3). To safeguard anonymity, the companies are not mentioned by name. In the logistics service industry, we interviewed three logistics service providers (LSP) of the Top 50 list; two multinationals (LSP1 and LSP2) and one national player (LSP3). The persons interviewed are logistics or sustainability managers. They were initially contacted by e-mail or phone to ask for a face-to-face interview. Two interviews were held by phone (with FC2 and LSP3), because time of the managers was limited. The interviews took approximately one hour and were recorded with audio-device and transcribed to make sure no information was missed. For each partner the steps of the sustainability assessment framework were discussed. First, the drivers and sustainability objectives were identified. Then successively, the relevant performance indicators and measurement methods, the sustainability improvement opportunities, and the barriers they experience were inventorised. We will now discuss the main findings.

### *Drivers for sustainable strategies*

Table 4 presents an overview of the internal and external drivers mentioned by the respondents. The food industry and logistics service industry are positioned next to each other to show similarities and differences in internal and external drivers for sustainability.

**Table 4.**  
Drivers for sustainability mentioned by the companies

<b>Internal drivers</b>	<b>FC 1</b>	<b>FC 2</b>	<b>FC 3</b>	<b>LSP 1</b>	<b>LSP 2</b>	<b>LSP 3</b>
Cost-savings	x	x	x	x	x	x
Reputation / branding		x	x		x	x
Positive effect on environment	x	x	x		x	
Continuation of company; 3P- vision	x	x	x			
It is in the genes of the company	x		x		x	
Enthusiastic top-management	x		x			
Efficiency improvement		x	x			
To improve employee situation		x				x
Opportunities because of science and technology	x				x	
Responsibility as pollutant				x	x	
Cost benefit for clients					x	
Internal reputation to employees						x
<b>External drivers</b>						
Market dependance	x	x	x			
Client dependance				x	x	x
Opportunities in current policy and regulations		x	x	x		x
Stakeholders influence		x	x			

Interestingly, most emphasis is given to internal drivers. All food companies emphasise continuation of the company, cost-savings, and positive effect on the environment. FC1 and FC3 also share two other internal drivers; enthusiastic top management and "it is in the genes of the company". FC2 and FC3 share efficiency improvement and reputation as internal drivers. The food companies have one corresponding external driver; market dependence. This is a combination of consumer wishes, and actions of competitors. However, FC1 and FC3 acknowledge market dependence but state that, for them, pressure from clients is not a driver for sustainability. The LSPs have one corresponding internal driver; cost-savings. As LSP1 states "Our driver is energy savings, and thus cost-savings." LSP2 and LSP3 both add that they also feel responsible for their actions and try to build their reputation. LSP3 states "It's a combination of client demand, ..... and social responsibility." The LSPs also have one corresponding external driver; client dependency. Moreover, LSP1 states that when a client does not prefer

sustainability, sustainable services will not be executed. LSP3 states that “environmental care and sustainability is a factor that is considered more and more in client tenders”.

### ***Sustainability strategy***

Results show emphasis is on process improvement; during the interviews it was often stated that sustainability can only be realised when it is economically efficient, since this enables the continuation of a company. One respondent even states that improvement of sustainability is never the core business of a profit organisation; making profit is. On the other hand, some of the best practice companies focus on branding and have defined a sustainability strategy. Both industries acknowledge that acting sustainable increases their reputation as it shows their concern with the environment to their stakeholders. Overall, LSPs do have a wait-and-see attitude towards sustainability. In contrast, food companies state that they want to make steps, especially because the market demands more sustainable products.

### ***Barriers for sustainability improvement***

The barriers perceived in sustainability are foremost caused by the characteristics of the industry. It is stated that the logistics service industry is less dynamic, independent and changeable and therefore less involved in sustainability. Collaboration in the supply chain is the most important improvement opportunity perceived. However, collaboration with competitors by bundling flows is perceived with reluctance by the logistics service industry. They perceive barriers in problems with cost divisions and social-cultural issues like trust. Moreover, collaboration between LSPs is perceived as cartel forming by other, non-collaborative LSPs. Other barriers mentioned are presented in Table 5; note that external barriers go beyond a company’s own capabilities. An important barrier is the fact that legislation and social pressure as well as infrastructures are not equal in all countries.

A number of specific barriers on performance measurement were mentioned. This related foremost to the difficulty to measure social sustainability, difficulty to standardize due to different approaches of countries, difficulty to measure the results of sustainability initiatives and the existence of too many different measurement methods. As a food company stated: “Every LSP has its own measurement method in excel. This counteracts benchmarking and universal measurement.” The fact that a universal measurement system is lacking and necessary to measure sustainability is not shared by all respondents. The interview results show that front runners in the food industry want to benchmark, whilst followers are less enthusiastic about a measurement system. In findings on the logistics industry this is the other way around. The front runner experiences a lot of complexity, whilst the follower desires a universal system since it could help them to measure and improve sustainability. Thus, thoughts about a universal measurement system are diverse and assumed to be company-specific.



**Table 5.**  
Mentioned barriers for sustainability improvement

<i>Type</i>	<i>Barrier</i>	<i>Company</i>
Internal	Requirements as a stock-listed company	FC1
	Economic focus jeopardised by sust. focus	FC2, LSP1
	Lack of information sharing	FC3
	Awareness of employees is lacking	LSP1,LSP2
	Internal political barriers	LSP1
	Characteristics of company	FC1, LSP2
	Reporting at wrong departments	LSP2
	Sub-contracting to LSPs	LSP2
	Social-cultural aspects in collaboration	LSP3
	External	Differences within Europe and globally
Dependency of client demand/market		FC1, LSP2, LSP3
EU policy		FC1
Government has slower way doing business		FC3, LSP3
2/3 sustainability issues at the consumers		FC3
Economic crisis		LSP1,LSP2
European rail network does not connect		LSP1
Multiple initiatives in different countries		LSP1
No insight in long-term cost benefits		LSP1
Cost division in joint networks		LSP2
Contract term with client		LSP2
Characteristics of industry		LSP2
Collaboration seen as cartel forming		LSP2
The will and necessity of collaboration		FC1, LSP3
Collaboration enforces transparency		LSP3

## 5 Discussion and conclusion

This paper presents the drivers, strategies and KPIs that food companies use, the improvement opportunities that have main attention in industry and, finally, the barriers that companies experience in sustainability improvement. The results of the desk research are strengthened by the results of the interviews.

The low focus on the profit dimension in sustainability reports can be explained by the fact that companies do not relate profit directly to sustainability performance measurement, since profit whether or not related to sustainability, is always measured (as stated by FC3). The research shows that both industries have a different attitude towards sustainability. LSPs have the wait-and-see attitude. For example, LSP1 states that big investments for sustainability will only be made when all clients demand sustainability and that this is currently not the case. They state that sustainability can also come with smaller, less expensive steps. This explains the low level of external and innovation-oriented sustainability initiatives of LSPs. In contrast, food companies state that they want to make steps, especially because the market demands more sustainable products. In both industries current short-term contracts are experienced as a barrier that counteracts opportunities in sustainability. It is stated that short-term contracts limit food companies and LSPs' resources for sustainability investments, due to the uncertainty the short-term contracts bring to especially the logistics service industry. Long-term contracts – hence more intense collaboration in the supply chain - are seen as an opportunity since it can create more investments possibilities and 'freedom' for logistics service providers. FC3 already operates with long-term contracts which according to them make chain-wide sustainability more realizable. Most improvement opportunities that interviewees mention are internal related to infrastructures, but also the creation of a positive attitude towards sustainability gets attention. The interviewees indicated that the mind-set within employees of LSPs is not yet focused on sustainability, whilst the mind-set of employees of best practice food companies is.

To conclude, we presented an integrated sustainability assessment framework for 3BL indicators covering the economic, environmental and social aspects of food chains along the entire life of the products with emphasis on food logistics. This framework and the subsequent applied methods for evaluation are intended to propose a structured and rational method for assessing the sustainability. From this research, in which parts of the framework were applied, we can derive the following managerial implications:

- There is a need for universal sustainability performance measurement methods that allow for benchmarking of (best) practices on predefined performance indicators.
- Many improvement opportunities are applied in practice to upgrade sustainability performance, but it is not clear yet which options are best applied in what circumstances. More case based research is needed to evaluate this using advanced decision support models that are able to make integrated tradeoffs between multiple sustainability indicators.
- All interviewees stated the importance of supply chain collaboration and establishing relationships with key suppliers and customers to increase the sustainability performance of the chain. Low hanging fruit can be picked by redesigning processes and infrastructures within company walls; more significant improvement requires collaboration in the supply chain. This requires a transition from short-term contracts to strategic relationships with long-term contracts.

Since this research is an explorative and qualitative research with only a limited number of interviews, it means that no statistical or generalizable statements can be made regarding sustainability practices in Dutch food industry. The preliminary findings provide insight in the current best practices as well as bottlenecks, and clear indications for further research. In the SCALE project, more extended research will take place, finally resulting in three pilots in which improvement options will be implemented and tested in close cooperation with the pilot companies. Sophisticated modeling tools will be developed to assess the impact of improvement options on performance and allow for the design of effective improvement scenarios. Via additional interviews and cases with more companies in more countries we hope to generalise our findings and further develop the sustainability assessment framework for food supply chain logistics into a practical tool for sustainability improvement.

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