

Sustainable Development in Liege's Red Meat Value Network : an Exploratory Qualitative Analysis

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Sustainable Development in Liege's Red Meat Value Network : an Exploratory Qualitative Analysis

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Executive Summary

Context: We are in a period in which businesses' responsibilities have been extended beyond simply financial returns, hence, including also environmental and social performances. Managers then must deal with a broader set of stakeholders and further account for the Triple Bottom Line outcomes throughout the entire value network they operate in. The high pressures faced by the red-meat industry in the sustainability debate and the economic relevance of the subsector in Liege's basin makes it relevant to observe when analyzing sustainability practices.

Objectives: The purpose of this thesis is to build an industry-wide diagnosis of the sustainability-oriented practices employed by the actors of Liege's red meat value network.

Methodology: We perform semi-structured interviews designed to collect each participant's practices implemented in response to the identified issues faced in the sector on the environmental, social, and economic dimensions. The sample consists of 7 actors operating at 4 different stages of the chain to have an acceptable overview of the sector. The majority of the interviewed actor are industrial processors.

Findings: Most traditional methods and processes employed in the Walloon red meat industry positively contribute to the sustainability of the sector. Nevertheless, the network has displayed slow progress in terms of innovativeness and proactivity to enhance their long-run sustainability.

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1. Introduction

Since 1987, the United Nations officially defined sustainability as the new perspective to adopt when managing a modern business. The complex socio-economic context in which we currently evolve pushed firms to awaken their 7th sense and become aware of the far-reaching social and environmental impacts of their activities to preserve future generations. While the raising customer awareness and the emerging legal requirements increasingly frame companies' responsibilities towards society, today's businesses must compete on a wider set of dimensions than ever before.

Consequently, as firms strive to account for the sustainable impact of all their activities, they were pushed not only to re-think their internal operation systems, but also to re-model how value is managed and added throughout the whole value stream they are active in. Ever since, adopting supply management perspectives became a norm across modern businesses attempting to pursue sustainability-oriented strategies collectively with partners. Throughout time, such a vision further evolved. Firms extended the boundaries of their thinking beyond direct vertical value chain partners. Specifically, they now consider their interactions with the broad social environment to enhance their sustainable performance and satisfy the new expectations they are facing.

Food systems, encompassing actors from farm to fork, have been at the heart of several sustainability-oriented debates. Among many subjects, food security, food safety, and food products' environmental footprints have been investigated by the United Nations in their journey to sustainability. However, amongst all the public debates being held, one particularly appealed our attention.

The heavy publicity of environment, animal well-being, and food safety -related scandals caused the recent reputational decline of the red meat sector. While several articles describe red meat as the most polluting food and consumers increasingly avoid purchasing meat-based products, the Walloon red meat industry is experiencing an alarming market downturn. The economic contribution of the sector to Southern Belgium coupled with its cultural significance in the region makes it a relevant market to analyze from a sustainability point of view. Indeed, while the industry actors have been subject to various polemics and one-sided criticisms from consumers, NGOs, or other pressure groups, one could find it interesting to examine the other side of the debate and assess the sustainability of the Walloon red meat operators' practices.

Hence, this paper aims at shedding light on the underexposed side of the debate by providing a value-network-wide analysis of the sustainability of Liege's red meat industry. This will be achieved by exploring the practices put in place by the sectoral players to address their current environmental, social, and economic challenges. The research question is therefore the following: What supply chain methods are employed in Liege's red meat industry to address the current sustainability challenges? In order to obtain the relevant findings, semi-structured qualitative interviews have been conducted with industrial actors relevant to Liege's red meat value network.

To pursue, after this introduction, we provided a literature review to explore the institutional context and the relevant theoretical concepts associated with sustainability, sustainable performance measurement, and sustainable supply chain management. Subsequently, we defined the scope of the study in a funnel-like fashion, hence, starting with the European food industry and finishing with the Walloon red meat subsector and the relevant players it involves. Once the scope boundaries were drawn, we identified the sustainability-oriented challenges faced by the relevant actors. Followingly, we finished the literature review with hypothetical operational and generic solutions to address the lastly described issues. Right after, the methodology was explained, including the sample design and interview scheme. Finally, the technicalities being clarified, we listed our findings, discussion points, limitations, and suggestions for future research.

2. Literature Review

2.1. Introducing Sustainability

“Sustainability” is a word that has been at the heart of several business and political discussions in the previous years. In 1987, the United Nations Brundtland Commission came up with the following definition of this term from a socio-economic perspective: *“meeting the needs of the present without compromising the ability of future generations to meet their own needs”*. This definition has much deeper implications than it seems at first glance. Through these words, the United Nations propose a holistic approach for worldwide development unifying social and economic growth with environmentalism (McGill University, 2013). Followingly, this philosophy opened the path for current and new businesses to pursue broader/bigger goals than the purely economic ones. Resultingly, an ever-growing literature background on sustainability-related theories has emerged since the beginning of the 21st century. Such concepts include the Triple Bottom Line, short circuit value chains, Sustainable Supply Chains, and many others that will be used throughout this study.

Hence, sustainability has been incorporated in the research of educational institutions as well as in the objectives of international and regional political bodies through the use of programs enforcing organizations to transform the way they do their business towards sustainability outcomes (Chofreh et al., 2020). In addition, it is no secret that consumers have become increasingly aware of the contemporary social and environmental challenges during the last decades.

All these factors combined, today’s businesses are facing an unprecedented pressure from their external environment that leads them to integrate new sustainable business practices and apply new theories to their business models in order to satisfy their various stakeholders. The following sections of this literature review therefore begin by covering the institutional context that settles companies’ objectives in the sustainability debate. Subsequently, the theoretical concepts and frameworks (relevant to this study) that were built around sustainability, along various problem-solving approaches built to tackle socio-environmental challenges are investigated.

2.2. Institutional Context

2.2.1. UN SDGs

Sustainable Development Goals are the fruit of an initiative launched by the United Nations to foster global sustainable development. It aims at ensuring worldwide prosperity through a 15-year plan, which kicked off in 2015. Specifically, this plan includes 17 broad sustainability goals that UN member countries will try to reach for year 2030. The official list of SDGs can be found in the display below.



Figure 1: Sustainable Development Goals (Retrieved from <https://www.un.org/development/desa/disabilities/about-us/sustainable-development-goals-sdgs-and-disability.html>)

One can notice the high breadth and depth of these goals that are in fact grounded according to the 5Ps; 5 dimensions of worldwide sustainable development defined by the United Nations): Planet, People, Profit, Partnership, and Peace (United Nations System Staff College, 2016). The classification of SDGs along these can be found in the Figure 2.

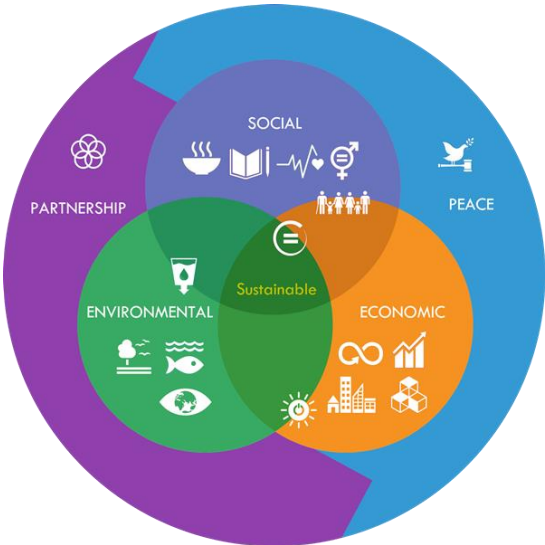


Figure 2: Placing Sustainability at the Core (retrieved from <https://www.unssc.org/news-and-insights/blog/sustainable-development-what-there-know-and-why-should-we-care>)

All in all, these sustainable goals set very diverse and challenging objectives for the engaged countries, which can be recognized as the direct actors of this global program. Consequently, this UN initiative involves the participation of all actors in society (governments, civil society, nonprofit organizations, and the private sector companies) at both the national and regional levels and directly shapes way of living of business according to the country’s global mission (Mio, C, Panfilo, S, Blundo, B., 2020).

2.2.2. SDGs In Belgium

This research being conducted within the Belgian boundaries, it is relevant to shortly describe how the worldwide challenge of sustainable development is tackled at the national institutional level and how the country is performing along SDGs.

First, the challenge of sustainable development in Belgium is clearly embedded in the long-term missions of the country. The main governmental body set up to demonstrate Belgium’s commitment to sustainable development challenges is the Federal Council for Sustainable Development (that was called National Council for Sustainable Development until 1997). This organization, which was assembled under the law of May 5th (1997), aims at coordinating the country’s federal policy on sustainable development. The Council operates thanks to the collaboration and discussion of a wide range of relevant stakeholders (such as environmental organizations, organizations for development cooperation, consumers, scientists, etc.) with representatives of the federal government. Their exact roles are to advise the government, foster discussions, diffuse information, and conduct research about sustainable development as their main goal is to adapt our country’s internal regulations to implement Belgium’s international commitment towards sustainable development (FRDO CFDD, 2013). It is therefore logical that the 17 SDGs framework, being a concise representation of our country’s international objectives in terms of sustainability, provide guidance to the Council (and hence the government) to shape local actors’ political and economic environment to in fine align their objectives with the UN’s.

Despite having the Sustainable Development Goals shaping the current federal policy, hence articulating most long-term objectives designed for Belgium and its organizations, one should be aware

of Belgium’s performance relative to its fellow UN members along the various SDGs. Indeed, such analysis is beneficial as it allows us to uncover the main points of action in order to keep our country up to date with the current state of sustainable development worldwide.

The figure under, provided by Eurostat (2022), shows the evolution of Belgium’s sustainable performance relative to the EU average. Even though this tool is too weak to provide an analysis of our country’s global performance, it can serve as an effective proxy to unveil the critical areas to treat in order to improve the Belgian sustainable development.

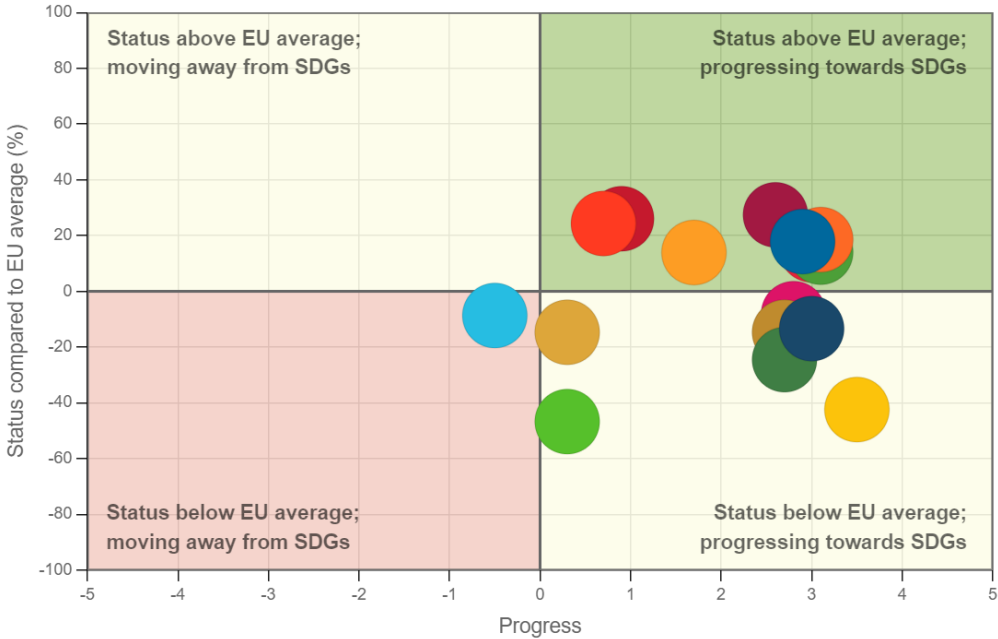


Figure 3: SDG Country Overview (retrieved from <https://ec.europa.eu/eurostat/cache/infographs/sdg-country-overview/>)

This graph shows that overall, Belgium has been positively evolving along the SDGs in comparison with other EU countries, except in the Clean Water and Sanitation SDG (the light blue dot), in which we seem to go away from our objective. However, it is also crucial to highlight that despite our progress in most areas, Belgium still performs under average in its journey towards various SDGs like the Life on Land, Affordable & Clean Energy, Responsible Production & Consumption, or Zero Hunger ones. Therefore, undertaking research about the actors and phenomena (with their obstacles) that impact our country’s journey towards these SDGs could contribute to maintaining our progress regarding these objectives and could even accelerate it to try catching up with the EU average performance along these metrics.

In addition, as stated earlier, SDGs should be in principle pursued by any type of actor in a country (c.f. Mio, C, Panfilo S, Blundo, B., 2020). To confirm the relevance of this business study, one should mention that the UN describe the private sector companies as crucial in the attainment of SDGs given their amount of resources/knowledge and their presence in a wide range of sectors. Therefore, analyzing private companies in their relevant industry can be perceived as a logical first step in understanding the mechanism of Belgium’s progress towards sustainability.

2.3. Sustainability Theories and Sustainable Performance Measurement

2.3.1. Triple Bottom Line

As explained earlier in this paper, SDGs cover a large panel of issues and should be addressed by any type of actor. Despite having the main role to find success in the quest to global sustainability according to the United Nations, companies can still face trouble in figuring out exactly which area of sustainable development they actually affect. More importantly, it is still confusing for organizations to measure their performance in terms of sustainability as its importance is steadily growing in several aspects of management. In order to solve this issue, intense research has been conducted to uncover means for firms to evaluate their sustainable performance in a relatively systematic manner (Hourneaux F. Jr et al., 2018). Nowadays, one of the most famous methods used by organizations to conceptualize and measure their sustainability is called the Triple Bottom Line.

In its original definition provided by John Elkington in 1998, the Triple Bottom Line has been described as a reporting tool for sustainability. More precisely, it can be perceived as an accounting framework for an organization's triangular progress based on 3 bottom lines: the financial, social, and environmental ones. When this theory got exposed, it disrupted firms' traditional purely financial reporting schemes by incorporating ecological and social metrics to these (Slaper T.F., 2013). In other words, the Triple Bottom Line is a performance measurement tool based on the 3Ps of sustainable development: People, Planet, Profits. Additionally, one could recognize and easily draw the link between the Triple Bottom Line performance and the 5Ps around which the United Nations built the Sustainable Development Goals.

Despite the high relevance of the Triple Bottom Line in the exercise of assessing firms' sustainable performance, the model still shows a major weakness that is recognized through this thesis. Indeed, while it provides a strong basis to measure a company's contribution to sustainable development, the social and environmental dimensions advocated through the reporting framework are complex to strictly measure (Sridhar K., Jones G., 2012). Furthermore, Hubbard (2009) states that social and ecological performances are difficult to quantify as they are unique to each corporation, or at least industry. Hence, this idea being accepted in the context of this study, I believe it is mandatory to cautiously define the boundaries of the social and environmental dimensions addressed by the industry that will be analyzed in the following sections. An approach to cope with this downside of the theory will be proposed in the following sections of the thesis.

Also, even though the Triple Bottom Line reporting framework was initially designed to analyze individual firms' sustainable performance, this paper supports the idea that SDGs should be addressed by firms together as an industry. Therefore, the management of the entire supply chain is crucial along the Triple Bottom Line, and some deeper understanding of the Sustainable Supply Chain Management theory should be built to continue this study.

2.3.2. Sustainable Supply Chain Management (draw links with value chain and stakeholders double bell approaches to problem solving)

2.3.2.1. Evolution of Supply Chains as a Basis for Sustainable Supply Chain Management

Nowadays, one can observe an evolution in consumers' behaviors in developed countries. Indeed, consumption has been steadily increasing over the years while people would always require higher standards to put any product in their basket. Such behavior naturally led the local firms to fasten their production pace while increasing their degree of processing in order to meet the stricter standards imposed by the population (Papargyropoulou E., Lozana R., Steinberger J.K., et al. 2014). This recent turn in customers' behaviors towards heavier consumption coupled with the exponential technological progress over the last decades have driven up the exploitation and pollution of natural resources to

further sustain the worldwide economic development (Rajeev A., Rupesh K. Paty, Sidhartha S. Padhi, Kannan G., 2017).

From a Supply Chain Management perspective proposed by Papargyropoulou et al. (2014), this recent phenomenon increased the complexity of organizations' value chains in parallel with the number of actors involved in them. Resultingly, as stated by Corbett C.J., Boukherroub T., Bouchery Y., et al. (2017), in new supply chains, companies' ties are no longer strictly limited to close vertical operators. In the authors' opinion, companies now share risk with a broader set of stakeholders, hence, including NGOs, regulators, society in general, and all these actors can today have a real impact on companies' well-being. This point of view is especially valid in the context of Sustainable Development, where all entities and all value networks are supposed to push together for a prosperous future in all the Triple Bottom Line dimensions. The idea is also further advocated by Corbett C.J. et al. (2017), whose analyses explain how for many firms, the main stakes in sustainable performance lie in the outskirts of their boundaries, hence, necessitating a broad value chain (or even value network) perspective when thriving for sustainable development goals.

On the flip side of the coin, paradoxically to the growing customer expectations and consumption (that have inherent adverse environmental effects given their impact on companies' production), the large group of stakeholders to which firms are confronted today have imposed pressures on regulators and business entities regarding the environmental footprints of their activities (Rajeev A. et al., 2017). As stated by Tate W.L., Ellram L.M., and Kirchoff J.F. (2010), consumers require businesses to produce high-quality, safe, and environmentally friendly products with manufacturing processes with low externalities on the environment and social communities. The active pressure of the parties at stake therefore pushed businesses to launch sustainable and green management initiatives to finally reduce their costs, increase their efficiency, and more importantly improve customers' overall satisfaction. This new stakeholder perception can be considered as a pillar of Sustainable Supply Chain Management and will be investigated in depth in the next sections.

As a consequence of the recent pressure faced by business organizations regarding the environmental externalities of their operations, Green Supply Chain Management is one of the first concepts that have been intensively exploited in the literature (Rajeev A. et al., 2017).

2.3.2.2. Green Supply Chain Management

Srivastava (2007), who was quoted in Rajeev A. et al.'s work, described Green Supply Chain Management as a mean of integrating environmental thinking into the whole value chain of an organization. Such a concept involves implementing ecologic practices in every area of Supply Chain Management. The author classified in five categories the domains in Supply Chain Management where actions aiming at diminishing the environmental footprint of a value chain could be taken:

- Product Design
- Material Sourcing/Selection
- Manufacturing Processes
- End-of-Life Product Management
- Delivery of Products

Through the last list, the researcher captures most leverage points to mitigate the adverse environmental impact of a firm's entire supply chain. It is obvious that these operations involve a plurality of actors among a company's value chain. Therefore, this list strengthens the interest of adopting a broad perspective of an organization's value network when attempting to reach environmental targets through supply chain management.

All in all, given the well-spread interest towards Green Supply Chain Management in the literature, one could conclude this concept offers a solid starting point to undertake environmentally viable projects at a supply chain level. Nevertheless, Sustainable Development (as it was defined in the earlier

sections) is built around the three pillars considered in the Triple Bottom Line reporting framework: environmental, social, and economic. Hence, as highlighted by Rajeev A. et al. (2017), one of the major weaknesses displayed in this theory is that it solely focuses on the environmental pillar of Sustainable Development. The concept therefore seems insufficient to cope with the Sustainable Development challenges identified in the UN's Sustainable Development Goals project as it fails to capture the social performance dimensions to which supply chains should give attention today.

In response to this downside, theoretical literature emerged, pointing out the importance of the social performance throughout a firm's supply chain.

2.3.2.3. CSR in Sustainable Supply Chain Management

In the last decade, research around Supply Chain Management increased in breadth. While it initially focused on solving economic and environmental issues by changing firms' operations, the literature evolved and tried to incorporate social challenges in the scope of Supply Chain Management, alongside the economic and ecologic ones (Feng Y., Zhu Q., Lai K.H., 2017). However, according to Marshall D., McCarthy L., Heavy C., and McGrath (2014), fewer research tackled the social component of sustainability, and even less focused on the social and environmental components together. One could therefore deduct from such a situation that companies have greater difficulties to find the best practices in Social Supply Chain management compared to Green Supply Chain Management.

Nevertheless, Marshall D. et al. (2014) came up with the following definition for Social Supply Chain Management Practices: *"Social practices focus on health and well being of people in the supply chain and impacts on society"*. This definition being accepted in this paper, supply chain practices acting on the lastly quoted dimensions, which are also included in the Sustainable Development Goals scheme set by the UN, will be further categorized as solutions enhancing firms' social performance in a given industry.

Finally, when merging the theories of Social and Green Supply Chain Management, one can finally reach the main theoretical concept around which the following study will be based: Sustainable Supply Chain Management.

2.3.2.4. Defining Sustainable Supply Chain Management

The grouping of Social and Green Supply Chain theories hence pushed researchers to broaden their perspective of Supply Chain Management and accept both environmental and social dimensions in their performance measurement. Rajeev et al. (2017) quote Ahi and Searcy's definition of Sustainable Supply Chain Management established in 2013 in their study: *"The creation of coordinated supply chains through the voluntary integration of economic, environmental, and social considerations with key inter-organizational business systems designed to efficiently and effectively manage the material, information, and capital flows associated with the procurement, production, and distribution of products or services in order to meet stakeholder requirements and improve the profitability, competitiveness, and resilience of the organization over the short- and long-term"*.

This definition of Sustainable Supply Chain Management severely increases the complexity of the exercise of managing supply chain operations and designing long term strategies as it broadens the objectives of traditional supply chain management. Through this study, I address two major challenges emerging from this definition: performance measurement in sustainable supply chains and stakeholders management.

2.3.2.5. Challenge 1: Measuring Sustainable Supply Chain Performance

One can find many arguments in the literature, discussing the complex relationships among financial, social, and environmental elements interacting together in supply chains (Hall J., Matos S., Silvestre B. 2011). Specifically, as stated earlier in this literature review, the relationship between social and environmental performances are still ambiguous today (Marshall D. et al, 2014).

The lastly quoted definition of Sustainable Supply Chain Management can therefore lead readers to the work of Hall J., Matos S., and Silvestre B. (2011), who characterize sustainable supply chains as complex systems. Their definition given by Simon (1969) describes them as situations involving several interactive variables, hence, systems in which all variables are interrelated and have a positive/negative influence over each other. Furthermore, Marshall D. et al (2014) share a similar point of view (inspired by Pfeffer, 2010) regarding the complexity of Sustainable Supply Chain Management by stating that trade-offs have to be incurred to pursue social and green supply chain practices as these are often realized at the expense of each other. The authors further defend this idea in their paper by claiming that although many studies use sustainability as a single concept incorporating both social and environmental dimensions, there is evidence that this is not the case for businesses in reality.

However, this debate being out of the scope of this study, I try to circumvent this difficulty by separating clearly the social and environmental dimensions of the Triple Bottom Line. Marshall D. et al (2014) point out the fundamental differences between social and green practices in the following way. On one hand, environmental practices focus on the use of resources and the effect of operations on the physical environment. On the other hand, social practices focus on the health and the well-being of people along the supply chain, and the impact on society (in the context of this study, this definition will be extended by including animal well-being related practices to the social category). Even though recent discourses extended environmental responsibility to social responsibility by claiming that harming the environment can also negatively impact human health, this paper supports the view of Marshall D. et al. regarding this subject. The authors claim that these negative effects being observed over a very long term, they are very hard to substantiate and can remain in the “environmental section” of sustainable performance.

After having strictly sundered the two dimensions, one could ask along which metrics should these aspects of sustainability be quantified to finally have an objective, numeric performance measure for sustainable supply chains. However, the aim of this thesis is to provide a high-level, holistic analysis of the supply network of the Walloon meat industry from a sustainability perspective. In a nutshell, the research of strict metrics can be considered as out of the scope of this study.

Resultingly, this paper instead accepts the framework proposed by Monastyrnaya E., Yannou Le Bris G., Yannou B., et al. in 2015 to build sustainable value chains. In fact, the authors put forward a problem-oriented foundation to establish sustainable supply chains. The goal in this exercise is to identify the leverage points on which value chain actors should act to further ameliorate the sustainable performance of the whole chain. Later in this thesis, these action points will be classified along the environmental and social dimensions of the Triple Bottom Line and will be associated to corresponding Sustainable Development Goals included in the United Nations’ program.

In addition, according to Monastyrnaya E. et al. (2015), this problem recognition phase requires collecting information among the chain’s stakeholders in order to clarify the main sustainability-related issues associated with the value chain actors’ activities. This method therefore naturally leads to the second challenging area of Sustainable Supply Chain Management highlighted in my paper: stakeholders management. Indeed, as stated in the literature previously analyzed through this study, sustainable development transcends organizational boundaries (Marshall et al., 2014) and therefore require systemic approaches for problem solving (Hall et al., 2011).

For any business, it is assumed in the literature that managing such a broad set of stakeholders is a huge challenge. Therefore, stakeholders management concepts deserve particular attention in this thesis, as provided in the next section.

2.3.2.6. Challenge 2: Stakeholders Management

As it has been repeated in the previous parts of this thesis, sustainability concerns have extended today’s businesses’ responsibilities and pushed them to account for the needs of a broader set of

stakeholders. To tackle such a challenge, companies should now incorporate the needs of relevant parties in their sustainable value proposition, which will together represent the three pillars of the Triple Bottom Line (Monastyrnaya E. et al., 2015). However, involving such a large number of actors in a project of sustainable development of a supply chain naturally gives birth to various complexities and dilemmas.

De Brucker K., Macharis C., and Verbeke A. (2013) describe the three stakeholders-related challenges faced when evaluating a sustainable development project. These challenges are recognized in this paper and will be taken into account when assessing the various sustainable practices implemented by the actors of the Belgian meat industry.

First, managing a sustainable development project involves making choices and all the practices put in place provide distinct contributions to the long-term strategic objective. Specifically, large-scale projects regularly lead managers to accept tradeoffs among several outcomes. In the case of sustainable development, one can observe conflicting motivations such as narrow-scope economic goals, broad social considerations, and environmental targets.

In the continuity of the first one, the second challenge regarding such a complex project is therefore to ultimately align the stakeholders' interests in an optimal way.

Finally, De Brucker K. et al. (2013) point out that in most cases, the adoption of specific practices or projects typically has "*distributional consequences*". In other words, the different groups of interest are impacted distinctly by each practice, hence, becoming 'winners' or 'losers'. In the author's opinion, at the end of the implementation phase of a project, one should analyze the net benefits (benefits minus losses) of the chosen practices on each stakeholder. The aim of this assessment is to know if the tradeoffs among stakeholders have been successfully managed in the design of the sustainable strategy.

The lastly described challenges will therefore be taken into account in the value chain analysis proposed in this thesis as various players' perspectives will be examined. Nevertheless, for a firm to be able to identify the tradeoffs to be incurred throughout its chain and manage its network to achieve long-term sustainable goals, a first task should be performed to highlight the relevant stakeholders. In the context of this paper, I will use the Double Bell Model (Sadler, *Logistics and Supply Chain Integration*, 2007) to identify the main stakeholders of the meat value network in the Liège basin from a specific focal actor. The next section therefore introduces Sadler's Double Bell Model in a generic way. The framework will later be used to visualize the relevant business sector.

2.3.2.7. Double Bell Model

The motivation behind Sadler's study is well-aligned with the stakeholders theories and the modern sustainable supply chain vision that have been described earlier in this paper. Indeed, the author points out that it is insufficient for any organization to undermine their vision and focus solely on their own operations. In Sadler's opinion (which is accepted in this thesis), a firm must consider the entire physical and informational flows going up and down the value stream. Moreover, the companies should be aware of their coordination role relative to the whole network and address the challenge of collaborating effectively to provide an improved service or product to customers and in fine ensure the prosperity of every network member.

Consequently, in order to help organizations to adopt this wider view and identify the main components and mechanisms of their value network, Sadler came up with the "Double-Bell model" (shown in Figure 4), which is a generic framework picturing an entire value network of a specific industry. More precisely, it displays the network from raw materials sourcing activities till the final consumers.

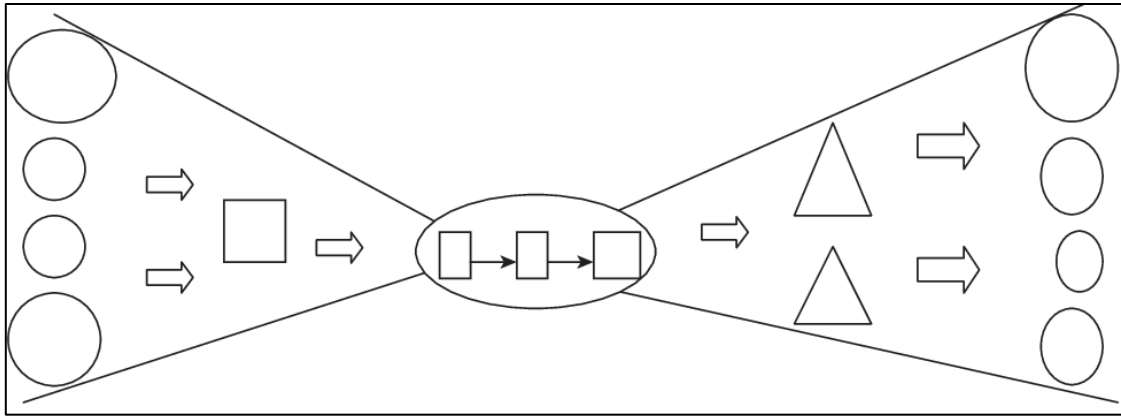


Figure 4: the Double Bell Model (from *Logistics and Supply Chain Integration*, by Ian Sadler, 2007)

On the left-hand side of the model, one can identify various suppliers and further intermediaries through which the physical materials and the informational data go to finally reach the focal point of this network: the manufacturer. Then, logically, Sadler associates the ellipse at the center of the diagram to the focal actors. Furthermore, this section entails the whole transformation process by which raw materials pass to be turned into finished products and services. Finally, the far-right part of this scheme captures all the downstream actors, such as logistic operators, other intermediaries, and retailers, whose task is to transfer the finished goods and services to the final consumers.

Overall, this framework can be considered as an important tool to establish an integrated supply chain. The deep insight analyzed by Sadler through his study is that, for supply chains to be successful, businesses should integrate the development of their products across the whole chain, using the links and the collaborative power of all the actors together to in the end provide the goods and services the consumers expect.

The fundamental thinking behind the Double-Bell model and the power of this tool are therefore recognized through this thesis. Nevertheless, one can also highlight the fact that Sadler narrowly focuses on the vertical actors of a supply network. As it is already stated in the Sustainable Development literature, including social purposes to an organization's value proposition broadens even more its scope in terms of stakeholders. I believe that in such context, the Double-Bell model should be complemented with an additional dimension including the institutional actors and the society as a whole, as the final consumer is not the only actor that firms should satisfy anymore. A new framework, strongly inspired from Sadler's Double-Bell model, will therefore be designed in the following sections depicting the Belgian meat industry.

2.4. Food Industry in Sustainable Development

2.4.1. Food Industry Definition and Key Numbers

In order to better expose my motivations to address the sustainability issues of the Liège meat sector, I believe it is important to first provide a definition and assess the relevance of the entire food industry towards Sustainable Development, in order to lead this context description in a funnel-like fashion.

The food industry, classified in division 10 of the NACE (Nomenclature statistique des Activités économiques dans la Communauté Européenne), reunites the transformation activities of the agriculture, forestry, and fishing products into food suitable for human or animal consumption. In addition, this division takes into account some variety of intermediary products (generated during production) that are not used for nutritional consumption (Eurostat, 2010).

In 2019, 15.9 million people were employed in the food sector in the European Union, hence, accounting for 8% of total employment (Eurostat, 2020). Regarding its revenue, the industry generated €1,621.00 bn in 2022 and is projected to grow by 4.48% on a yearly basis until at least 2027 (Statista, 2022). Furthermore, in relation with total population numbers, the revenues of the food industry generated per person have been amounted at €1,909.00 in 2022 (Statista, 2022). To sum it up, this industry is fast growing and represents one of the key sources of value added in the European Union. Given the large volume of its operations, one can anticipate the complexity of this industry along with its significant impact on the Sustainable Development plan launched by the UN.

2.4.2. Complexities of the Food Industry

As a whole, the food industry involves a wide panel of products such as meat, fish, fruit and vegetables, oils and fats, dairy products, cereals, etc. (Turi A., Goncalves G., Mocan M., 2014). In addition, Turi A. et al. (2014) highlight how the food value chain encompasses a high diversity of activities from the sourcing to the final distribution. Such a characteristic consequently requires numerous actors like farmers, manufacturers, logistics operators, wholesalers, retailers, etc. to interact together. The authors further advocate that overall, such complex supply chain structures make the industry appear as one of the most dynamic and challenging ones. Furthermore, Bloemhof J. and Soysal M. (2017) describe food supply chains as apart from the others, given the constant noticeable variation in the quality of food across the whole value chain. Such an element can be recognized as another complication to consider the industry.

Putting everything together, these examples of complex facets of the industry show the particular level of cautiousness scholars should adopt when studying the lastly defined sector, especially when examining it from a sustainability point of view. These complexities therefore drove up the motivation behind this paper to focus on a small subsector of the industry in order to keep a reasonable level of preciseness and relevance regarding the observed sustainable practices.

2.4.3. Relevance of the Food Industry in the Sustainable Development Debate

Although it is generally understood that the food industry represents a significant part of our cultural identity and that it plays a key role in the economy, the average consumers still lack knowledge regarding the sector's impact on the world's natural resources (European Commission, 2016). Even if today one can still observe the raising awareness of customers and businesses towards this topic, an increasing number of studies question the evolution of production and consumption habits in the food industry, hence, doubting the sector's long-run sustainability (European Commission, 2016). Additionally, in their framework designing sustainable food systems written in 2018, the Food and Agriculture Organization of the United Nations (F.A.O.) also highlighted the alarming shift in the functioning of the Food Value Network in Europe. As they stipulate it, the industry should be examined considering the current demographic and economic context characterized by a fast-paced population growth, urbanization, the growing wealth, globalization, a change in consumption patterns, alongside the climate change and the depletion of scarce natural resources problematics.

The steep evolution of the sector caused by these elements led to an overall significant transformation in the system's structure, which followingly drove up the pressure on the social (nutrition and food security related) and environmental (energy and pollution related) challenges of the industry (Food and Agriculture Organization of the United Nations, 2018). This increased pressure has been ongoing over years now and is well-reflected in the following discourse of the European Union Standing Committee on Agricultural Research (S.C.A.R., an advisory board of experts discussing the future of agriculture), quoted by the European Commission in 2016: *"Many of today's food production systems compromise the capacity of Earth to produce food in the future."*

One can indeed witness that major actions and decisions must be taken across the entire European Food System in order to enhance its sustainability. While this paper is backed up by the belief that the

United Nations’ Sustainable Development Goals program provides an interesting path to merge each food subsector’s long-term objectives, the idea that practices and stakes across these systems may differ is also supported. This thesis therefore offers a focus on the red meat industry in the Liège Basin (Belgium) in order to reduce the scope of analysis from both an industry and a geographic perspective. The motivations behind the scope choice are further justified in the following section.

2.5. Scope Definition: the Walloon Red Meat Industry

2.5.1. Environmental Motivation

The production of meat-based goods has been generally considered as one of, if not the most important production activity in terms of greenhouse gas emissions (United Nations, 2022). Indeed, the F.A.O. figures reported by Kumar P. et al. (2022), in their work on the improvement of the sustainability of meat production show that roughly 14.5% of total greenhouse gas emissions is contributed by animals reared for meat and dairy production. Such values can be visualized effectively through the following graphs, retrieved from an article of the United Nations on food and climate change.

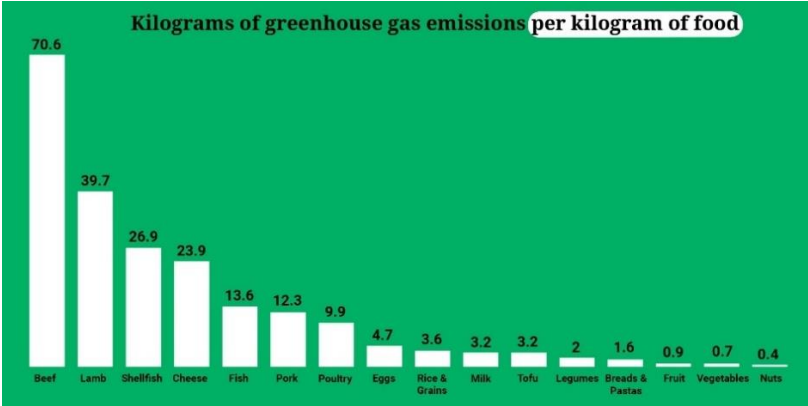


Figure 5 : Kilograms of Greenhouse Gas Emissions per Kilogram of food, (retrieved from https://www.un.org/en/climatechange/science/climate-issues/food?qclid=Cj0KQCQiAkMGcBhCSARIsAIW6d0AcUOpvPATC6Fbrwq1TzT9akBXqLsoetddABSTAQCCOKxP5EiHEtclaApXCEALw_wcB)

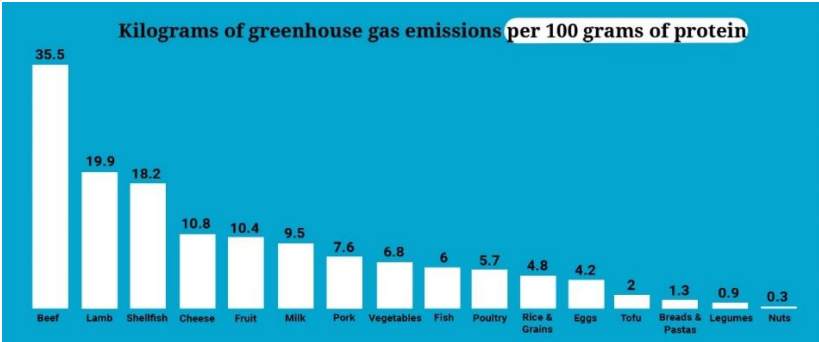


Figure 6 : Kilograms of Greenhouse Gas Emissions per 100 Grams of Protein, retrieved from https://www.un.org/en/climatechange/science/climate-issues/food?qclid=Cj0KQCQiAkMGcBhCSARIsAIW6d0AcUOpvPATC6Fbrwq1TzT9akBXqLsoetddABSTAQCCOKxP5EiHEtclaApXCEALw_wcB)

The displays depict the kilograms of greenhouse gases emitted for each kilogram of food produced, or per 100 grams of proteins generated (taking the nutritional value of the products into account). From this graph, one can observe how the red meat sector controversially dominates the ranking as the largest greenhouse gas generators of the industry. It is also important to specify that the main

commodities included in the red meat category are beef, lamb, and pork (European Livestock and Meat Trades Union, 2019), with beef having the highest level of emission throughout the production process (Farchi et al., 2017). In addition to these, sheep and goat meat can also be considered as red meat (European Commission, 2020).

Besides greenhouse gas emissions, the ecological outcome of the meat industry has also been critically assessed from a resource-based perspective. As Kumar et al. state it in their essay, most of the arable land conditioned for pastures and grasslands is dedicated to livestock production, with 40% of the total arable land being categorized as grassland and rangeland. In addition to this intensive use of land, the meat sector is also infamous for its heavy water consumption. Indeed, as highlighted by Farchi et al. (2017) in their study about meat consumption in Italian regions, meat production has heavy effects on the water footprint, water pollution, and water scarcity. Precisely, the water footprint of animal products sometimes reaches 20 times the water footprint of a crop with equal value in terms of nutrients.

The lastly described environmental factors already set the meat industry at the center of the current sustainable development debate, which brings up one's interest to study the relevant actors' reactions to these issues. However, a sustainable value system also addresses the social dimension of the activities it entails. In the following paragraph, the social aspect of the sector will be put forward, which enhances further the motivation to set the target of the red meat industry throughout this sustainability-oriented thesis.

2.5.2. Social Motivations

Several aspects of the social performance of the Western Europe meat sector have been under the spotlights lately, especially regarding animal welfare-related practices, over which a wide variety of academic articles have been written. This situation seems to arise from contradictory behaviors shown by consumers, who, during the last decade, required larger production volumes while increasing their sensitivity towards animals' well-being. Precisely, Nungesser F. and Winter M., in their sociological essay on the evolution of consumers' perspectives towards meat production and consumption (2021), refer to a "*pronounced dissonance*" between customers' sensitivities on one hand, and meat production and consumption trends on the other. This paradox, which stemmed from higher consumption and other far-reaching societal trends, is also reflected in the F.A.O.'s guidelines, which recommend food sectors to boost their production outcome while simultaneously lightening the effect of the negative externalities tied to their production and distribution operations (F.A.O., 2012). This problematic hence transformed the industry's practices, leading to heavy criticism targeting the industry, as some authors like Kumar P. et al (2022) accuse some actors to treat livestock as "*senseless production machines*"; an attitude leading to animal well-being violations or other ethical issues. Furthermore, as food supply chains evolved, Bloemhof J.M. and Soysal (2017) add a few relevant dimensions to the social sustainability of the organizations involved in the industry, putting forward the safety of the working environment, along with its hygiene.

Overall, taking part to this complex, multi-faceted debate and exposing current industrial practices addressing such broad societal challenges, in addition to the ecological ones, further justify the industry choice made in this thesis. Finally, this study focuses on the meat value network of the Liège Basin. This geographic scope is therefore argued in the next section.

2.5.3. Economic Relevance of the Walloon Red Meat Sector in the Belgian Context

The red meat sector has historically occupied an important position in the Walloon economy, especially the bovine industry.

The Belgian Walloon region today counts 15 slaughterhouses and 165 organizations performing bovine red meat processing activities. Furthermore, while roughly counting a workforce of 9100 people in upstream agricultural operations (from breeding till slaughtering), 2700 people in downstream

processing businesses, and 700 in distribution, the sector is recognized as a key value adder in the region, generating €480 millions of revenues in 2022, accounting for 43% of the total Belgian revenue (Filagri, 2022).

Despite its current high value, the bovine industry in Wallonia does not look as healthy as it was before, especially in the upstream activities. Indeed, the statistics show a dangerously aging and decreasing workforce on that side of the value network. According to the “Etat de l’Agriculture Wallonne” in 2022, the average age of the workforce among upstream agricultural actors of the industry was 55 years old in 2020, hence, depicting the decreasing interest of youth to take part in such professions. Moreover, the production of cattle in Wallonia decreased by one third compared to 1990 (Etat de l’Agriculture Wallonne, 2022). From these numbers, one can raise questions regarding the long-run sustainability of the sector.

On the other side, the pork and lamb markets display much lower numbers relative to the Belgian industry. While the number of cattle surpasses 1 million animals (Filagri, 2022), the pork and sheep sectors respectively produced 382,222 and 84,700 beasts in 2021. It is also relevant to add that Wallonia is only responsible for 13% of the domestic sheep meat consumption, while only 6% of all Belgian pork are actually raised in the region (Etat de l’Agriculture Wallonne, 2022).

Although these sectors obviously have a lighter influence over the Walloon economy, they will be included in the analysis provided through this essay given the similarities across their value networks and the common pressure they face towards sustainable development challenges.

To conclude, the economic importance of the Walloon red meat sector (and particularly the bovine one), in parallel with the high risk it currently faces in each dimension of the Triple Bottom Line, makes it a strongly relevant choice when addressing the sustainable development level on a local scale. One additional motivation behind this industry choice is to keep a certain level of geographical proximity with the interviewed actors to in fine enhance the communication and exchanges performed with them. I therefore chose to reduce the scope of this study further to the Liège Basin.

2.5.4. Defining The Red Meat Value Network

The thought of analyzing the meat value network in a general, holistic fashion has been extendedly put forward in the literature. Precisely, the Food and Agriculture Organization of the United Nations recently pushed actors to adopt a food system approach when reflecting on the sustainability of a food industry. The institution claimed that the sustainable development of food systems should be powered by a holistic thinking to generate value along the economic, social, and ecological dimensions.

The aim of this methodology is to avoid limiting one’s analysis to a sole value chain and to instead integrate the whole network of interlinked activities and feedback among the relevant actors of the system. Consequently, this way of proceeding would mitigate the shortcomings of traditional supply chain approaches tending to have a narrow scope while focusing on small-scale technical solutions (Food and Agriculture Organization of the United Nations, 2018). Furthermore, although the lastly quoted organization broadly considers the entire food system, one could believe it should also specifically apply to the meat sector sustainable development, as Kumar P. et al. advocated it in 2022.

Therefore, to observe the Liège Basin red meat industry from the same eye, a framework depicting the relevant value network is provided in Figure 7 (of which an enlarged version is provided in Appendix I). The relevant actors identified from the theory and the interviews (which is explained in depth in the methodology part of the paper) are then represented using the Double Bell model from Ian Sandler, described in the previous section.

However, a new dimension has been added to the model that was initially proposed. In order to formally stick to the holistic view suggested in the previous paragraphs and address the broad societal challenges highlighted in sustainable development, the social context of the sector is also pictured in

the diagram, involving political/industry-related institutions and societal actors. Before tackling the meat-industry-specific sustainability issues, the following section therefore brings more clarity to the context by providing a comprehensive description of the sector actors, alimented both by theoretical (NACE) definitions and practical insights gathered from the interviews. It is also important to note that only the colored actors from the framework will be subject to a deeper investigation through the interviews included in the thesis. However, a brief description of the other players, which is based on the interviewees' input, is still added to complete the context.

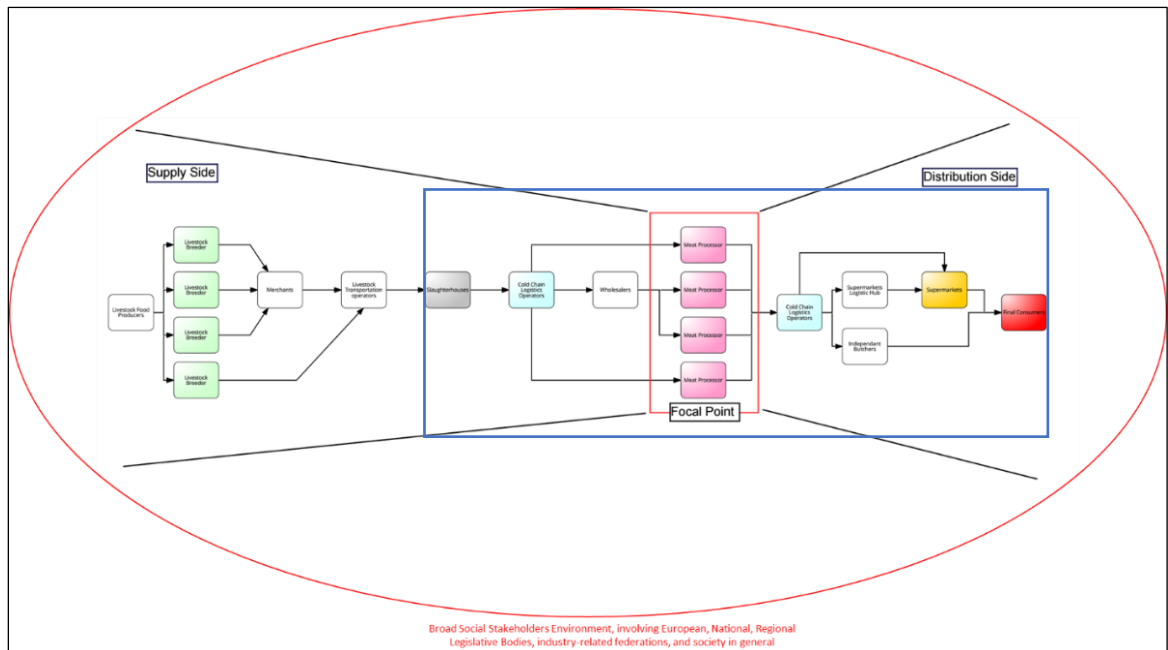


Figure 7 : the Meat Value Network, Adapted from the Double Bell Model (from *Logistics and Supply Chain Integration*, by Ian Sadler, 2007)

2.5.4.1. Livestock Food Producers

Categorized in class 10.91 of the NACE repository, these actors form the very first step of the value chain and process feeds for any category of farm animals. When the breeders do not have the materials to produce food for their beasts themselves, they mostly rely on large-scale livestock food providers having a wide clientele. These actors therefore stand in a strong position towards the next upstream operators: the breeders (Interview participants 1 and 2).

2.5.4.2. Livestock Breeders

The focus of this study being extended to the most important types of red meat from a sustainability perspective, namely, cattle, pork, and lamb, one can see the breeders (represented by the green boxes in the framework) separated in three classes of the Statistical Classification of Economic Activities (NACE). First, cattle breeding activities are encompassed by section 01.42 of the NACE code, being called “*raising of other cattle and buffaloes*” (NACE Code, 2008). This category distinguishes itself from other cattle raising activities as it focuses on meat instead of dairy production. Second, lamb breeding is included in class 01.45, namely, “*raising of sheep and goats*” (NACE Code, 2008). Finally, pork raising activities are ranked in section 01.46 of the classification called “*raising of swine/pigs*” (NACE Code, 2008).

Throughout the interviews, all the participants aligned on the idea that the Walloon market of breeders is shaped in a rather fragmented way, meaning that it is composed of numerous small actors. Although a few players in this category still perform relatively large-scale activities and are sometimes integrated

in a processor's supply chain, a common method for individual breeders to gain weight and negotiation power among the value network is to join their forces in collaborative trading bodies (Interview participants 1, 4, and 7). Their role being essential for the well-being of the entire sector, the current personnel crisis and the low margins they currently face, which were recognized by all interviewees, make this level of the meat value network a leverage point for the long-term sustainability of the industry.

Regarding the breeding process, the interview participant 2 made the distinction between the meager and fat market. Indeed, whilst some farmers feed and fatten their beasts themselves, hence, selling them directly for consumption, the others also have the possibility to trade meager animals, leading to a smaller added value and margin for the farmer. In the last case, another actor (omitted in the provided framework), oversees the fattening of livestock before it is suitable for production.

According to the experts interviewed for this thesis, the general transaction between Walloon breeders and the next players happens in two main ways. On one hand, some of them directly send their beasts to the slaughterhouse. In that case, the downstream customers are already known and are ready to receive their share of the breeder's production. On the other hand, the breeders can trade their beasts with livestock merchants, which are defined in the next paragraph.

2.5.4.3. Livestock Merchants

These actors are grouped in section 46.23 of the classification, called "*wholesale of live animals*". Regarding their activities, one could imagine the merchants as a link connecting the small-scale breeders and the processors, passing through slaughterhouses. In fact, a large number of breeders meet in places called "cattle markets". Wallonia counts 3 out of the 5 existing Belgian cattle markets, which are managed in collaboration with regional institutions. The volume of the activities ongoing in these trading hubs is important, with tens of trucks bringing thousands of beasts, which represent the average weekly livestock production of the industry (Marché aux Bestiaux de Ciney, 2022). These markets are ideal places for the merchants who are allowed to select the quantities and types of breed suitable for their customers to achieve most of their trading transactions.

While some actors like participants 1 and 2 do not rely on such intermediary processes for their procurement operations, this kind of transaction is still relevant in today's industry. One can also possibly anticipate the consolidation effect such practices have on livestock trade or see it as an additional fragmenting element of the value chain, reducing further the low margins of the actors.

Followingly, in order to transfer the cattle from the merchant/breeder to slaughterhouses, specialized transporters are the next actors to play a role in the chain.

2.5.4.4. Livestock Transporter

Categorized broadly in the "*freight transport by road*" category of the NACE classification (49.41), livestock transport is often subcontracted by breeders to tertiary logistics partners. While the majority of interviewees demonstrate short distances in the transports of livestock among their chain (the relatively small territorial area of the country being one argument to justify such statements), the Walloon Region still requires the transporters to show an official authorization for journeys above 65km.

Conclusively, the livestock transporters reach the slaughterhouse with beasts coming from various breeders to the slaughterhouse where the execution of livestock takes place.

2.5.4.5. Slaughterhouses

Slaughterhouse operations are an unavoidable process in the meat value chain. They are currently classified in section 10.11 of the NACE code, namely, *“processing and preserving of meat”*. These actors are in fact in charge of the killing of beasts and sometimes process further the carcasses by pre-cutting them before handing them over to wholesalers, or directly to the final processing operators.

As it was explained by interview participant 5, slaughterhouses can be qualified as transition service providers linking the breeding stage to the final products producers. Wallonia currently counts 15 official slaughterhouses (Filagri, 2022), and while some of them are private and belong to corporate groups directly related to the industry, some others are publicly managed by local municipalities. Hence, the service provided by slaughterhouses can be two-fold. On one side, they can perform large-scale operations for important merchants, wholesalers, or meat processors, which generally represents the largest portion of their yearly revenues. On the other side, slaughterhouses can act as one-time service providers for smaller breeders and process a very limited number of beasts for them.

These service operators also represent a starting point for the cold chain, which is maintained until the final consumption stage.

2.5.4.6. The Cold Chain

The food cold chain can be defined using the following sentence: *“a systematic engineering process involving the use of a low-temperature environment to maintain the quality and safety of perishable food and reduce food loss and waste”* (Chen, Q., Qian, J., Yang, H., & Wu, W., 2022). In the meat industry context, cold chain logistics therefore start when carcasses are obtained at the end of the killing process, and last until the final consumption step, as depicted by the blue, rectangular zone in Figure 7. Every downstream actor must therefore ensure that the right temperature is maintained either in storage, transports, or during transformation operations in order to deliver a final product that meets mandatory quality standards.

Cold chain measures taken by the meat-sector businesses are therefore crucial to allow them to pursue their activities. Indeed, while being carefully monitored by official external entities to ensure food safety for final consumers, cold chain processes allow to extend the lifetime of fresh products, hence, granting the actors with greater flexibility in their daily operations and better quality for their final offerings.

2.5.4.7. Meat Wholesalers

Wholesalers are intermediary actors performing large-scale purchasing transactions with merchants (who sometimes also perform downstream wholesale activities) and breeders to provide ready-to-be-processed raw meat to the next downstream actors. They appear in the NACE class 46.32: *“wholesale of meat and meat products”*. Such businesses derive value from the easy link they offer between the breeders and processors. As typical wholesalers, who are not supposed to process the products they sell, meat wholesalers simply facilitate the transfer of meat from slaughterhouses and downstream producers, hence, profiting from markups added to the outcome obtained at slaughterhouses.

Furthermore, while some producers developed partnerships with wholesalers, others bypass these intermediaries and preserve direct relationships with the breeders upstream. It also seems that processors rely more easily on wholesalers when the local livestock supply cannot fulfill their demand, as the cattle-focused players interviewed in this thesis (having access to large supply quantities) tend not to rely on wholesalers, in opposition to the pork and lamb transformers.

2.5.4.8. Meat Producers and Processors

By following Ian Saddler's recommendations regarding the Double Bell model, the meat processors (colored in pink) are the focal point of the value network depicted in Figure 7. They are encompassed in class 10.13 of the NACE code: "*production of meat and poultry meat products*". These actors can also be considered as the final product manufacturers of the value chain. Precisely, the production outcomes of the various actors interrogated for this thesis were either ready for final consumption or requiring relatively low processing from butchers and final retailers. Furthermore, the Walloon participants appeared to work principally with fresh meat products, hence, using frozen meat as a buffer to fulfill unusual demand or face a supply shortage.

The Walloon processors that were interviewed share the common characteristic of centering their operations on the distribution in the Belgian, if not the Walloon market. A large portion of their high production volume is therefore dedicated to the large-scale distribution sector, namely, supermarkets, and sometimes the food service industry. These actors also derive revenue from their transactions with smaller downstream actors like independent butchers, or from the "*fifth quarter*" sector, entailing all the by-products valorization and distribution.

From a supply chain perspective, these actors also appear to have the highest degree of integration. Indeed, being positioned at the focal point of the value system, the majority of the interviewed processors have contributed to the development of activities up or down the chain (breeding or logistics operations), while having historic relationships with the large-scale retail sector (supermarkets).

2.5.4.9. Logistics Operators

Although the activities in question are different, the downstream logistics operators (marked in blue in Figure 7) are grouped in the same NACE class as the livestock transporters (note: some companies perform both up and downstream transportation tasks). As one could expect, maintaining the cold chain from processors to retailers is a major responsibility for which these logistics operators are accountable. Specialized trucks are therefore necessary to ensure the good functioning of these transports.

While some meat producers have integrated their logistics operations by developing partnerships or operationalizing their own fleet of refrigerated vehicles, some others rely on third-party service providers that are sometimes tied to industry peers. The trucks can therefore be filled by various actors at the same time and perform rounds, hence, distributing the final products to supermarkets logistics hubs, to supermarkets directly, or to independent butchers, which logically represent a smaller volume.

2.5.4.10. Meat Retailers

The final actors identified in the Walloon meat industry, who are in direct contact with final consumers, are the retailers. Throughout the interviews, the meat retail subsector has been divided into two sets of actors. First, the actors responsible for the highest volume are the supermarkets (represented in yellow in Figure 7). They are included in the NACE section 47.11 called "*Retail sale in non-specialised stores with food, beverages or tobacco predominating*". These retailers either provide an integrated butchery service or propose meat final products in refrigerated shelves. Then, specialized butchery stores occupy the second share of the market. These players are categorized in class 47.22, defined as "*Retail sale of meat and meat products in specialised stores*".

In addition to generating a lower sales volume than their industry peers, this share of the market is more fragmented, hence, composed of numerous relatively small stakeholders. From a technical perspective, it would also be wrong to limit the butchers' activities to basic retail operations as some of the final processing operations are still performed at this last stage of the value chain.

2.5.4.11. Societal Actors (Europe, Nation, Region, Industry)

Finally, the proposed framework adds the broad social environment as a component of the Walloon meat value network. While it is clearly noticed among the participants that today's social environment frames the actors' operations, they described their social context as a funnel. Precisely, four levels of the social frame were cited, going from the widest to the most specific influence: the European, the national/federal, the regional, and the industry levels.

First, the European and international political bodies have had a significant impact on the meat sector's behavior. For instance, on the international level, the public witnessed the United Nations and the Food and Agriculture Organization launch sustainability actions. The reach and power of such organizations further influenced the European bodies to set the direction for member countries to pursue such objectives through regulations. As it has already been the case for traceability and food safety issues, the influence of such players shaped the European legal environment, hence, pushing whole countries and industry members to meet new mandatory standards regarding the recognized challenges.

Subsequently, in a funnel-like fashion, the Belgian government tailored the local legal scheme to set binding regulations for industry actors to push them to meet the standards required at a higher level. For instance, the Federal Agency for the Food Safety of the Food Chain represents the governmental authorities to ensure proper traceability and hygiene across any food system.

As the geographical scope diminishes, the next relevant actor is the Walloon region. This political body establishes governance and regulations for local businesses to address economic, social, and environmental issues at the Walloon level. These challenges involve elements such as regional resources management, workforce maintenance, animal well-being, etc. (Wallonia's smart specialization strategy, 2021).

Finally, while the previously mentioned actors appear to defend the consumers' interests by monitoring the firms' economic, ecological, and societal impact, other industry-specific organizations exist to put forward the interests of the meat industry operators. In this context, federations play the crucial role of enabling discussions among politics, industry actors, researchers, and other types of stakeholders to present the sector's interests and address its current challenges (Interview participant 6).

2.5.5. Measuring Sustainable Development in the Red Meat Sector

As it was already clarified in the previous sections, enhancing the sustainable performance of an entire value network such as the meat sector in Liège requires action from every player. Consequently, in order to analyze the industry actors' responses to their current sustainability challenges, the first step is to precisely define how the Triple Bottom Line performance of the sector will be measured.

For that purpose, this paper is primarily inspired from Monastyrnaya E. et al. (2017), who propose a template tailored for the design of sustainable food value chains. In order to determine sustainability objectives, the authors suggest a value chain approach, gathering the environmental, social, and economic issues faced by every operator of the chain. Such an approach was also adopted by Golini R. et al. (2016), whose proposal aims at developing the sustainability of the Italian meat supply chain.

After having set the objectives for the sustainable development of value networks, the given studies suggest evaluating the sustainability of value networks through a problem-oriented approach. In other words, they assess the sustainability performance by examining the practices implemented across the chain to address the most relevant challenges. Although one can find extensive literature attempting to build complex quantitative tools for sustainable performance measurement, this paper remains general and provide a clear critical view of the best practices identified by the interviewed actors to contribute to the sustainable development. The strengths and flaws of these practices will therefore be addressed in parallel with their operability and their contribution to the United Nations' Sustainable Development Goals. Using this value chain assessment method in the Walloon meat sector and framing the evaluation according to the SDGs will allow to picture both the actor-specific and industry positions towards the sustainable development debate.

While Golini et al. and Monastyrnaya et al. respectively found the sectoral problematics through interviews and discussions among stakeholders, another methodology is used for this thesis. Indeed, since a sole set of interviews is performed, the sustainability issues recognized for each actor were initially found in the literature. However, interview questions were adjusted to complement the theoretical base set from the start. Hence, Figure 8 below displays today's relevant sustainability challenges for the Walloon red meat sector, for which deeper explanations are given in the following paragraphs.

Issues Across the Meat Value Chain

	Breeder	Slaughterhouses	Industrial Processors	Logistics Operator	Distributors/Retailers	SDGs Implications	
Environmental	Waste Disposal				Waste Disposal	SDGs 9, 6, 12	
	Intensive Agriculture					SDGs 12, 13, 15	
		Industrial Pollution				SDGs 9, 12, 13	
		Packaging				SDGs 12 & 13	
	Logistics-Related Pollution						SDG 13
Social	Traceability, Food Safety, Hygiene					SDGs 3 & 12	
	Animal Well-Being					SDGs 12 & 15	
	Workforce Skills, Sufficiency, and Age						SDG 1 & 8
		Local Sourcing			Local Sourcing	SDGs 1 & 8	
	Social Reputation					SDG 8 & 10	
Economic	Food Losses and Waste					SDGs 2 & 12	
	Low Margins					SDGs 1 & 8	

Figure 8 : Sustainability Issues in the Walloon Meat Value Chain, Adapted from the Sustainability Critical Points Along the Supply Chain Figure (from Golini R. et al., 2016)

2.5.5.1. Environmental Dimension

Waste Disposal

This environmental challenge was initially acknowledged through Golini R. et al.'s study and was confirmed by the interviewees. It encompasses the management of material waste generated by the production processes throughout the value chain. While one can witness that national legislations, international regulations and directives regarding waste minimization and by-products valorization exist in the food industry (Otlés S. et al., 2015), participants 1,2, and 5 highlighted three categories of meat waste existing in processing operations. Together, these types of waste form the so-called "fifth quarter", which are in fact the inedible production leftovers of processing and slaughtering operations. Specifically, the categories are organized in the following way:

- Category 1: this type of waste is not suitable for human nor animal consumption. As for instance the spinal cords, these should be destroyed for health and hygiene concerns.
- Category 2: this one is not suitable for human or animal consumption neither. However, it should not be destroyed and can be revalorized further (e.g., leathers, fats, etc.)
- Category 3: such waste is suitable for animal consumption and is generally reused in that way.

This ecological issue is therefore closely tied to the industry circularity and the actors' ability to close the loop at most levels of the chain. To pursue this mindset, the treatment of wastewaters is also included, while the packaging issue (being considered as a product development question) is raised individually after.

Hence, this challenge is primarily oriented towards SDG 12, which sets direction for responsible production and consumption. Furthermore, responding to the issue may also require the circular set up of the industry and innovative thinking from the players, hence, it may require contribution to SDG 9 called "*Industry Innovation, and Infrastructure*". Finally, including water in the lastly defined issue unveils the link with SDG 6 aiming for clean water.

Intensive Agriculture

This issue was recognized by Golini R. et al. as well as by the participants. It stems from the pressures and the publicity developed around the heavy resources consumption and pollution coming from upstream agricultural actors of the meat value network. As already shown in the previous sections, farmers currently face criticism, being held responsible for the degradation of land and intensive use of water in the breeding processes. Furthermore, the public also considers cattle as a naturally significant source of pollution and contributor to climate change.

Analyzing this issue in collaboration with sectoral actors will hopefully shed light on the integrated measures taken in the industry to minimize resources use and pollution upstream. However, interviewees collectively question the ongoing discussions by claiming that the communication made by authorities with regards to this debate lacks objectivity and is unfair towards Walloon breeders. This subject is therefore deeply investigated in the analyses of this thesis.

Regarding its position within the SDGs framework, this debate is logically entailed in SDG 12 about responsible consumption, which can eventually set the direction to solve the stated challenge. Additionally, SDGs 13 and 15 about the climate action and commitment towards a better life on land also capture the challenges related to the pollution and resources used in upstream operations.

Industrial Pollution

While the intensive agriculture point encompasses upstream activities, this new issue covers the polluting emissions and energy used encountered in the transformation processes of the meat supply chain.

The exploratory motivation associated with this challenge is to highlight the green operations schemes implemented in slaughterhouses and processing factories. Precisely, the leverage points highlighted by the participants are the energy sources used to power manufacturing operations, along the refrigerant gases used to maintain the cold chain.

Regarding this challenge, it makes sense to write how SDGs 9 and 12 (namely, "*industry innovation and infrastructure*" and "*responsible production and consumption*") are suitable to set the path for the coming years. In addition, the environmental impact of intense energy consumption and greenhouse gas emissions make this issue a relevant contributor to the climate action included in SDG 13.

Packaging

Packaging is a subject that was also cross-validated through Golini R. et al.'s work and the interviews. It is a threat that can worsen the environmental footprint of meat final products.

First, it is important to point out that this challenge was not declared relevant for any value-stream actors above industrial processors (Interview participant 5). Moreover, all the processing actors were aligned on the fact that packaging development practices were initially triggered by the final retailing businesses of the chain. Such an idea was then confirmed by participant 7, who witnessed an increasing will among his/her peers to propose sustainably packaged offerings. Consequently, trends of distributing final or sub-final goods in recyclable and re-usable packages seem to emerge in the industry, as detailed in the results of the analyses.

Finally, sustainable packaging would allow a more effective waste management scheme and hence, would contribute to SDG 13 addressing climate change by following the direction set in SDG 12 about responsible consumption and production.

Logistics-Related Pollution

In the literature, emissions generated through the transportations of goods and animals across the chain are also widely characterized as a contributing element to the ecological performance of food systems. Precisely, participants 1, 2, 4, and 7 identified routing (food kilometers) and vehicle novelty/maintenance as key emissions drivers in logistics operations. Furthermore, the refrigerating gas employed to maintain the cold chain in downstream logistics represent another increasing factor of the ecological impact of these activities (Interview participant 1).

Conclusively, the infrastructural evolution required to address such a challenge ties it directly to SDG 9. Then, positive results in this area would logically contribute to the objectives comprised in SDG 13, called "*climate action*".

2.5.5.2. Social Dimension

Traceability, Food Safety, Hygiene

In order to properly address food safety concerns, any active operator in a food chain must be able to trace a product all its way back to the original upstream actor (F.A.S.F.C., 2018). In addition to the European regulations existing for this purpose, every interrogated processor mentioned having to deal with regular audits performed by the Federal Agency for the Safety of the Food Chain. In fact, this organization collaborates with relevant certified actors to control businesses' infrastructures and enforce the legal obligations regarding traceability, hygiene, animal health, etc. throughout the food value chain (F.A.S.F.C., 2020). Moreover, it is also worth specifying that these regulations apply industry-wide standards without imposing practices. Consequently, when it comes to traceability concerns, each actor is held responsible for reaching these standards through methods set up by himself (Interview participant 6).

However, even if the obligatory traceability measures imposed by the legal actors are said to be built in the consumers' interest, the increasing awareness of consumers themselves also pushed the Walloon players to perfect their tracking systems. Indeed, as stated by participant 7 (being the closest to meat consumers), customers constantly pay more attention to the origin of their purchases and become more familiar with the informative displays on the packaging of products. Therefore, such a new behavior cause actors to increase their transparency and provide efforts in their traceability practices.

Overall, traceability is a mandatory process ensuring food safety for every meat consumer. This topic consequently falls perfectly in the objectives of SDG 3 about the health and well-being of the

population. In order to achieve that, responsible production processes (SDG 12) involving high hygiene and transparency are also crucial.

Animal Well-Being

Animal well-being is a concern affecting actors from the breeding till the slaughterhouse stages of the stream. Similarly to traceability, this social element is regulated by a governmental institution: the Walloon Region.

In Wallonia, the regional authorities defined three situations in which animal well-being is relevant: detention, killing, transports.

- Detention: here, animals' well-being involves the comfort they live in. Precisely, the feeding process, the room provided for living, and the veterinary services provided must suit the needs of the animals.
- Killing: first, the people performing such operations are required to obtain the necessary certificate (Walloon Region, 2022). Then, interview participant 5 claimed his/her responsibility to provide a stress-free treatment to the beasts from the time they leave the truck, until their final instants.
- Transport: in that case, reflections regarding animal well-being should include several points like the length of journeys, (un)loading processes, the room available for beasts in trucks, etc.

In addition to the legal dimension behind this issue, the interviewed meat processing actors insisted on acting on this aspect given the significant impact it had on the quantity and quality of the production output of upstream actors.

To come back to the SDG framework, reaching these norms would then allow the sector players to produce more responsibly (SDG 12) to ensure a better life on Earth for livestock (SDG 15).

Workforce Skills, Sufficiency, and Age

Initially, Golini R. et al. reported that workforce skills and satisfaction were important aspects on which sustainable supply chains should focus. However, the participants shifted the problem towards other dimensions of workforce conditions. Indeed, all the participants pointed out a worrying employment downturn covering the Walloon red meat industry. While the interviewees aligned on the idea that the primary cause of such a context is the damaged reputation of meat production and consumption, various negative consequences subsequently emerged from the discussions.

Regarding upstream problematics, participants 5 and 6 rang the bell on the dangerously aging population of breeders, which was already highlighted previously in the paper. Then, all the interviewees raised concerns considering a growing gap between employment supply and demand in the sector. Furthermore, participants undertaking meat processing activities described how the traditional yet technical aspect of their operations was an additional obstacle to find qualified staff to hire.

The findings regarding these workforce-related challenges will therefore aim at showing how this problematic is addressed in the short run and how the relevant players established their strategies for a longer time horizon.

These issues, which appear to be the most urgent in the breeding sub-sector, have the potential to endanger (or have already endangered) the economic sustainability of the Walloon red meat sector. It is therefore relevant to address them in the direction of SDGs 1 and 8, respectively called "*no poverty*" and "*decent work and economic growth*". Indeed, given the current level of employment in the sector, its potential for integrating local workforce, and its contribution to the regional economy, enhancing its attractiveness could bring up the Walloon GDP in the long run.

Attachment to Local Sourcing

Traceability can enhance companies' transparency and fulfill the customers' desire to know where the products they buy come from. However, such practices do not completely meet today's expectations. Indeed, all interviewees except participant 4 highlighted that meat consumption patterns were increasingly oriented towards locally sourced products, which are generally associated with greater quality. In addition, participant 7 (operating at the retail stage) stated that such a trend subsequently led final large-scale meat retailers to adapt their offerings to these new preferences, which caused repercussions in the purchasing policies of all actors up the chain. This tendency was also put forward in Golini R. et al.'s work on the Italian market, in which a retailing party claimed its customers valued more products sourced in Italy.

Overall, processors and retailers trying to respond to emerging customer needs through local sourcing can be considered as a societal challenge. Moreover, taking into account the Walloon red meat market socio-economic situation into account (c.f. employment and reputational downturns) reinforces the interest to tackle this issue for industry-related purposes.

Indeed, responding to this problematic can preserve and even foster local players' activities, hence, avoiding precarity for some parties and increasing its economic relevance. Conclusively, this added aspect lets one think that tackling this supply chain element helps pursuing the objectives set through SDGs 1 ("*no poverty*") and 8 ("*decent work and economic growth*").

Social Reputation of Industrial Actors

The reputation of the entire sector is in trouble given its tough position in the sustainability debate. This situation is especially reflected in the public discussions regarding animal well-being and the environmental footprint of breeders and processors. In addition, each participants saw this issue as a critical one given the significant effect it has over the economic well-being of the industry.

While Golini et al. claim that typically, tackling social concerns ameliorate the sectoral operators' social reputation, all the interview participants pointed out a form of asymmetry in the information disclosed to consumers. Precisely, the actors observe a growing distance between themselves and consumers as bad practices are regularly put forward without shedding light on the good ones actually implemented in the Walloon sector. In addition to advocating their entitlement to expose their own version of the situation, the participants are persuaded that contextualizing and objectivizing the debate would also change people's perspectives on the current sustainability issues associated with the Walloon red meat sector.

Furthermore, the participants recognized political authorities and customer lobbies as the principal information vehicles in the lastly described conversations. One can therefore anticipate the crucial role of the Walloon region or industry-specific organizations like federations (who have direct contacts with the opposed parties) to bring up the interests of the market.

Finally, by addressing this reputational degradation, the concerned players can potentially strengthen the industry's position in the sustainability debates on the long run. The pursuit of this path that involves hearing the production side to the same extent as their opponents therefore falls within the scope of SDG 10, through which the mission to reduce inequalities has been assigned.

Food Losses

Food losses are defined as "the decrease in edible food mass at the production, post-harvest, and processing stages of the food chain" (Food and Agriculture Organization of the United Nations, 2022). In the red-meat context, this definition is only relevant in processing and downstream transportation steps since these are the only ones involving food suitable for final consumption. The distinction made between this challenge and the first ecological one regarding waste disposal is therefore that food losses were supposedly destined to human consumption. This separate challenge consequently has a

dominant social dimension as it has deep implications in the food security debate launched by the Food and Agriculture Organization of the United Nations.

In the interviewees' eyes, food losses were typically considered as sunk costs that are worth being minimized through management and prevention methods that are available in the findings. When it comes to the breeding stage, participant 2 characterized food losses as the lack of productivity due to the mistreatment of livestock. Moreover, several causes for food losses have been identified throughout the conversations with red meat processors. These include the following: errors in consumption date management, packaging errors, processing errors, and overproduction.

When food losses refer to all the value chain levels until manufacturing, food waste is the term encompassing the unconsumed quantities at the retail and final consumption stages. On that subject, participants 6 and 7 highlighted wrong demand planning or unusual demand as the main causes. Although FAO statistics indicate that a higher proportion of edible food lost is food waste, this paper focuses on how industry-specific actors react to the current sustainability challenges. The consumers' role and available practices to deal with food waste will therefore not be included in my analyses.

Finally, one can confirm that tackling these issues would contribute to SDG 2 "zero hunger", which set the direction to improve long term food security. Minimizing food losses and waste would indeed increase the percentage of food produce that actually ends up in people's plate, while increasing the resource efficiency of producers. Additionally, one can believe that food loss reduction can be enabled via more responsible production practices, as entailed in SDG 12.

2.5.5.3. Economic Challenge

Low Margins

While most of the challenges listed above have economic implications for the Walloon sector, the breeders' low margins were the main economic concern recognized across Golini R. et al.'s research and the interviews performed for this thesis.

Although breeders are essential to the whole value chain, the long, fragmented format of this last combined with the increased economic pressures along the chain and the decreasing curve of meat consumption pushed downstream actors to require constantly lower prices for primary meat materials (Interview Participant 2). Furthermore, the relatively low bargaining power of breeders already described in this paper put them in the position where they must follow the price trends to survive and preserve their customers in the short run. One can also hypothetically draw the link between these low margins and the employment downturn one can observe at the breeding stages of the value network.

Overall, this subject was recognized as an alarming issue by participants 2 and 6 given the fact that these agricultural actors constitute a base on which the whole value network rely. Tackling it would therefore help to the economic survival of the sector. This point can consequently be framed in SDGs 1 and 8, respectively aiming at diminishing poverty and ensuring decent work.

2.6. Hypotheses: Sustainable Supply Chain Practices in the Walloon Red Meat Industry

Three sets of potential responses to the lastly defined sustainability issues have been identified through the analysis of literature. Firstly, some sustainability challenges highlighted in the framework involve mandatory regulations and therefore practices to be followed by the actors of the industry.

Secondly, when one centers his/her thinking on industrial manufacturing players (who are the focal point of this study), sustainable operations can appear as non-mandatory practices that can enhance their relative sustainable performance. This idea is further pointed out through the work of Bouchery Y. et al. (2017) as the authors mention that supply chains operations are a key to sustainability and

that improvements in sustainability outcomes ultimately require changes in the supply chain's operations.

Finally, the last set comprises the generic sustainable supply chain practices established by Beske P. et al. (2014). While the sustainable operations involve individual actions to be performed by actors, this additional list is more general and covers both the operational and strategic facets of sustainable development. Specifically, this conceptual framework brings a particular focus on integrative practices, hence, on cross-actor cooperation and stakeholders management (Beske P. et al., 2014). While some issues require such generic approaches in problem solving, these actions displayed in Figure 9 are also further interpreted as potential drivers enabling a better implementation of the two other sets of practices mentioned before.

2.6.1. Legally Regulated Practices

As already pointed out in the previous sections, the main legal regulations that emerged in the Walloon red-meat industry are established at two levels. On one hand, there are the food safety related rules, including the traceability and hygiene aspects to be maintained across the chain. These specifications initially come from European bodies, and are monitored by the federal authorities, namely the F.A.S.F.C. As a recall, the ultimate aim of traceability practices is to ensure transparency regarding all the stages through which final products passed to finally be able to trace back their path in case any food-safety issue happens. Furthermore, the same authorities perform regular hygiene checks among all actors of the food chain.

On the other hand, regional authorities set rules regarding animal well-being measures (described earlier) to be taken by upstream actors. Here again, participant 5 (slaughterhouse) confirmed being subject to several audits for that purpose.

Overall, these regulations set minimal standards to which actors must stick. However, all actors are held responsible for their own operations and implement their own practices to reach these standards. For instance, all the interviewed players put forward the full traceability of the Walloon meat value chain, while having all their own internal processes. The objective of this paper regarding that point is therefore to identify the best practices advocated by actors (for instance, linked to Beske P. et al.'s framework) to reach the imposed standards and even surpass them.

2.6.2. Operational Solutions

These methods are mostly focused on industrial processors. Being encompassed in SDG 12 (responsible production), they should allow companies to improve the social/environmental sustainability of their supply chain while pursuing their economic interests. The following points therefore include a definition of the retrieved practices and their potential contribution towards the highlighted issues (and by extension, the related SDGs).

Closed Loop Supply Chain Operations (retrieved from Abbey J.D. and Guide Jr. D.R., 2017)

Closed-loop supply chains schemes emerged from the managers' thinking of innovative processes to diminish the ecological footprint of the companies while increasing their profits. They involve various practices to foster the reuse and revalorization of materials throughout the supply chain. In other words, closed-loop supply chain operations allow to optimize the value creation over the entire lifecycle of a product (Abbey J.D. and Guide Jr. D.R., 2017). This set of actions can therefore be described as an entire system involving tertiary actors, operating in parallel with the regular industry value chain. Furthermore, the authors point out the ever-evolving character of these practices depending on the materials to valorize and the sector in which the players are active.

In the Walloon red-meat sector, closed-loop operations could therefore intervene from the slaughterhouse till the final retailing activities (for instance, where fifth quarter products are obtained), in order to minimize the waste generated and add value to it. Conclusively, this potential solution could

contribute to the resolution of the waste disposal and food losses/waste issues that were previously defined.

Sustainable Packaging (retrieved from Blanco E.E. and Sheffi Y., 2017)

In this case, packaging sustainability is defined as the extent to which primary and secondary packaging are reused or recycled. This measure therefore mainly depends on the type of materials used. Sustainable packaging practices were already identified through Golini R. et al.'s picture of the Italian meat industry. It will therefore be examined whether the actors in Wallonia followed the same trend or not.

Green Logistics (retrieved from Blanco E.E. and Sheffi Y., 2017)

The concept of green logistics emerged following discussions on how to lighten the adverse environmental effects of transports throughout supply chains. Today, the authors claim that governments and companies intensified their focus on green logistics and that resultingly, several best practices and frameworks have been suggested. Following that trend, Blanco E.E. and Sheffi Y. ranged 5 major variables driving the environmental costs of logistics operations.

- Distance: on how much distance are the products transported?
- Mode: which transportation mode is used?
- Equipment: which equipment is used to facilitate transports (fuel, trucks, ...)?
- Load: how the routing problem is answered, and how efficiently are the trucks loaded?
- Operation: how skillful are the drivers and how is the logistics plan optimized?

To summarize, improving these dimensions through their logistics strategy would enable the Walloon red meat sector players to mitigate the pollution emitted through transports and to contribute to more sustainable operations.

Green Inventory Management (retrieved from Marklund J. and Berling P., 2017)

Marklund J. and Berling P. present green inventory management as the answer to the two-faceted question on how to efficiently manage inventories and physical flows with respect to costs and emissions. Precisely, the researchers pointed out 3 main sources of emissions concerning inventory management.

- Emissions associated with ordering (i.e., production and transporting).
- Emissions associated with holding goods in inventory.
- Emissions associated with not satisfying demand on time.

Green inventory management therefore involves any practices aiming at diminishing these variables while taking economic tradeoffs into account. They consequently relate to the downstream actors dealing with physical flows of good in their daily activities (i.e., slaughterhouses, processors, retailers). Moreover, while such practices would primarily address the industrial pollution issue highlighted in this thesis, they could also have a deeper impact on logistics and production processes as the authors point out the interlinkages between these operations.

Green Facility Location (retrieved from Martínez J.C.V. and Fransoo J.C., 2017)

In addition to the inventory and logistics operations, green facility location also aims at weakening the negative ecological effect of transportations. According to the authors, thoughtfully building a logistics network (from a geographic point of view) is closely tied to the environmental and economic performance of transportations. Specifically, two major categories of emissions are mentioned in the theory of green facility location.

On one hand, one can identify the emissions from mobile sources (i.e., the transportation emissions). On the other hand, emissions can also emerge from stationary sources, including the facilities themselves and the availability of energy sources around them.

Green facility location therefore involves designing a logistics web that will minimize these emissions while considering the economic tradeoffs. It is another practice addressing the transportation-related and the industrial pollution challenges identified earlier.

Green Technology Choices (retrieved from Ovchinnikov A., 2017)

This theory focuses on companies' decision-making in terms of technologies to operate. As a starting point, the author defines green technologies as the ones diminishing the pollutive outcome per product created. Subsequently, technology choices have been differentiated among 3 scopes depending on the considered company's position in the value chain. First, scope 1 comprises the internal choices made by the focal company. Followingly, scope 2 corresponds to decisions made by focal actors regarding their energy sources. Finally, scope 3 includes up and downstream partners' choices. Furthermore, the author pointed out that the largest section of the sustainable operations literature was covering energy-related technologies, which will then be at the center of most companies' ecological dilemmas.

However, going for greener technologies often involves economic and operational tradeoffs. Ovchinnikov A. followingly identified 3 situations of which focal companies should be aware to solve the green technology choice problem.

- Case 1: the firm considers the issue of replacing a technology considered as dirty by a greener one.
- Case 2: the firm asks itself how much to invest in an existing technology.
- Case 3: the firm already has various technologies at its disposal and has to choose the "best" one.

In the context of this thesis, the focal actors concerned are the large-scale red meat processors. They will therefore be subject to the strongest focus regarding their reaction towards situations 1, 2, or 3.

Conclusively, one can believe that if each stream player embraces green decision-making philosophy when choosing a technology, the energy consumption (hence, industrial pollution) will decrease along the entire lifecycle of the product.

Direct Marketing (retrieved from Lee B. et al., 2019)

The choice of marketing channel represents a crucial decision for upstream farmers as it will determine the product value chain and its associated costs. Even if the breeders typically concentrate their activities on large-scale distribution streams, which allow them to trade higher volumes while minimizing their marketing costs, serious concerns have been raised regarding their declining margins. This problematic coupled with the increasing customer awareness about traceability and food safety therefore led some farmers to develop alternative direct marketing channels. In this type of scheme, upstream players basically abort all the intermediary stages of standards red meat value streams and directly propose final products to end customers.

Although the development of such activities requires significant investments and might not be feasible for every player, it also has the potential to improve the farmer's margins by increasing his/her added value while keeping final customers close to their purchases' origins. Consequently, having such alternative value streams in Wallonia could partially contribute to the resolution of the low margins issue faced by farmers, while also maximizing the traceability and "local sourcing" dimensions on the social side.

2.6.3. Beske P. et al.'s Generic Sustainable Supply Chain Practices

This last set of generic practices was based on 3 pillars of sustainable supply chains: the cooperation among actors, the triple bottom line performance, and the consideration of stakeholders' influences. Hence, the practices displayed in Figure 9 all together form a comprehensive framework to pursue the development of sustainable supply chains. Specifically, regarding the stakeholders, the researchers divided stakeholders in two groups depending on their power to harm or support the analyzed actors. Moreover, it is important to highlight that these last do not overlap, each of them covering a distinct aspect of sustainable supply chain management (Beske P. et al., 2014).

Table 1
SSCM practices.

SSCM Practices	Acronym
Orientation	
Supply chain management	SCM
Triple bottom line	TBL
Supply chain continuity	
Long-term relationships	LTR
Partner development	PD
Partner selection	SEL
Collaboration	
Joint development	JD
Technical integration	TI
Logistical integration	LI
Enhanced communication	EC
Risk management	
Individual monitoring	IM
Pressure group management	PRG
Standards and certification	CER
Pro-activity	
Learning	LEA
Stakeholder management	STM
Innovation	INN
Life cycle assessment	LCA

Figure 9 : Sustainable Supply Chain Management Practices (retrieved from Beske P. et al., 2014)

As one can observe in the figure above, the authors separated the practices into 5 broader sets, which are described under.

Orientation

This first aspect encompasses the strategic orientation of the players' values. According to Beske P. et al., a sustainability-oriented company should follow the Triple Bottom Line scheme and allocate equal effort along the three sustainability dimensions. Furthermore, the authors put forward the fact that companies should adopt a sustainable vision in every decision, even those not directly related to supply chain operations.

Supply Chain Continuity

In order to ensure the competitiveness of their value chain in the long run, firms should invest in long-term, resilient relationships with their supply chain partners. Hence, firms should also thrive for sustainable values via their partners, by engaging in responsible partner selection and development to enhance their interactions and the overall structure of their supply chain.

Collaboration

This dimension aims at incorporating the lastly described supply chain continuity within the firms' processes. This involves methods to integrate partners in technical and logistical operations.

Furthermore, the capabilities of actors to share information and jointly develop technologies, projects, or products is also encompassed by this category of practices.

Risk Management

This set of practices relates to the mitigation of stakeholders-related risks. It therefore involves monitoring suppliers, either by performing personal audits, or ensuring compliance of external standards such as ISO 14001 across the value chain. Furthermore, this category includes the monitoring, management, and engagement practices used to respond to adverse stakeholder pressures that could degrade the industry reputation.

Pro-Activity

Finally, the authors describe a firm behavior as proactive when this last is able to engage with its wider set of “supporting” stakeholders (e.g., political institutions or consumers) to further undermine pressures and even benefit from their knowledge. Additionally, learning (from partners or other sources) is another proactive practice pointed out by Beske P. et al., as well as preventively adopting a life-cycle view when developing a product. Conclusively, the authors insist on the importance of innovation in proactive sustainable developments of supply chains. Such innovations should anticipate and respond to the ever-evolving environment of sustainable industries.

3. Methodology

3.1. Sample Selection

3.1.1. Focal Participants

The objective behind our sample definition was to have an acceptable overview of the entire value network. To arrive there, we established the focal point of interest at the center of the supply chain, where industrial meat processors operate and interact with other players. One could debate that the actual central position of the value chain is occupied by slaughterhouses. However, as the majority of these only engage in slaughtering operations, the input from the interrogated players would have been limited. On the other side, we could notice a deeper vertical integration of activities from Liège’s industrial producers, which were consequently chosen as focal actors given the more promising source of insights they were representing.

Hence, among the seven selected interviewees, four perform meat production activities. Furthermore, in order to push further the idea to obtain a view of the red meat sector as a whole, participants were selected in the cattle, pork, and lamb meat subsectors. However, given the obvious larger economic importance of beef production in Wallonia, the sample includes a majority (4 out of 7) of players active in the cattle industry.

3.1.2. Up and Downstream Participants

In addition to industrial production companies, the willingness to get a clear industry value chain vision pushed us to include up and downstream actors in the sample. Consequently, supplementary data were gathered from one public slaughterhouse (upstream) and from one large-scale retailing player (downstream). About this last, it is relevant to mention that such a participant was preferred to any kind of smaller butchery shop, following the assumption that supermarket-volume meat retail has a more significant effect on sustainability issues.

Subsequently, the breadth of social sustainability issues led us to add an industry-related federation to the sample. Their position of mediator between governmental institutions, NGOs, researchers, and the sector itself makes them a relevant interlocutor to obtain a solid overview of the value network and its situation in terms of sustainability.

Finally, despite the issues reported in these areas, one will notice the absence of participants from the breeding and transportation stages. We admit that this can be considered as a weakness. However, while limited contact was available with breeders and logistics operators, we relied on indicators such as the yearly revenues and the extent of vertical integration of the initially chosen focal actors to further circumvent this issue. Indeed, 3 out of 4 of the chosen processors have vertically integrated upstream farming activities, and 3 out of 4 achieved the same with downstream logistics.

3.1.3. Geographical Delimitation

The group of players interviewed were gathered in the Liège basin, Wallonia, which displayed a relatively high concentration of red-meat processors. The goal behind the idea of interrogating participants from a same geographical area was to improve the coherence in the sample regarding their approach towards the sustainability challenges given the fact that they operate in the same social sector and have access to similar resources. It is also important to highlight the willingness to perform this study on the domestic Belgian market, which is clearly established as the principal focus for the interviewed actors. Furthermore, us experiencing strong proximity with the sample members enhance the quality of the exchanges performed during interviews.

Conclusively, a comprehensive table containing all the relevant data regarding the participants of this study is available in Appendix II. Moreover, the actors from whom information was obtained are represented in color in the Double Bell model depicting the Walloon red meat network (Appendix I).

3.2. Interview Design

Even though this study was redacted in English, the interviews were performed in French for the participants' convenience. This semi-structured qualitative interview tackled the issues highlighted in this paper, while being principally built around the three pillars of the Triple Bottom Line. It starts with a context definition, in which the interviewer gathers data and supply chain-specific information on the company and ensures the familiarity of the interlocutor with sustainability basics. Right after, the issues are approached, starting from the environmental ones, subsequently going through the social ones, and finally addressing the economic impact of the sustainability measures disclosed by the interviewee.

Since a sole set of interviews was performed, the issues-related questions were initially based on the problems pointed out in the literature. For that reason, the relevance for the problematics in the Walloon sector was questioned through the interview, together with the completeness of the list of issues initially presented. Such a method resultingly allowed us to build a comprehensive overview of the Wallonia-specific sustainability challenges of the meat industry.

The specific interview scheme is therefore found in Appendix III.

4. Findings

4.1. Environmental Issues

4.1.1. Waste Disposal

As it was previously described, this issue mainly relates to the reuse or disposal of meat materials (unsuitable for human consumption) or water.

As participant 6 (federation) stated, the entire Belgian red meat industry shows a high level of circularity, and all the industrial processors engage in closed-loop supply chain operations. According to the interviewee, such processes have lasted for years now. Hence, they have been standardized and are part of the traditional processes generally adopted throughout the network. This statement has

been highly strengthened by the actual behavior of the interview participants. Indeed, when it comes to meat-based production waste, every participant (1,2,3,4,5) pointed out their long-term relationships with third-party companies valorizing and redirecting categories 2 and 3 waste (bones, fat, blood, skin, ...) towards other industries (pharmaceuticals, animal food, ...). On the other side, category 1 waste (skulls, old animals' spines, ...) must be incinerated because of the health risk they represent.

In addition to this set of circular operations, every industrial processor also engaged in water reuse or cleaning of their wastewaters. On one hand, participants 2 and 4 share a local water treatment plant, aiming at neutralizing the environmental impact of their rejected waters and making them available for other industrial uses. In addition, both players claimed that other industry peers also solicitate these installations and that they invest together in research to ameliorate the treatment of their waters to even make it drinkable in the long run. Moreover, participants 1 and 5 also share such an infrastructure. In both cases, it is also relevant to point out that the water treatment plants are managed by local municipalities and regional bodies. On the other hand, participant 3 put different practices of water treatment into action, by partially reusing and revalorizing their waters to third parties.

While the diminishment of waste seems suboptimal in this case, the economic outcome for participant 3 is positive in opposition to other players, who must pay monthly fees to access the water treatment plants' services. On the other side, the assumed positive economic impact of meat materials closed-loop activities was described as neglectable by the concerned actors. However, the interviewees displayed various additional motivations pushing them to implement such practices. First, we noticed a "least-possible-waste" culture across participants, which may be one explanation why the lastly described processes have been ameliorated and standardized over the years. Then, participants 1 and 3 pointed out the room such material waste were occupying in their facilities. In that case, quickly getting rid of the waste also keeps the workplace clean while keeping necessary room for other value adding operations.

Conclusively, closed loop operations have been deeply studied and widely implemented across the Walloon red-meat value chain, hence, improving the sector's sustainability. Furthermore, the traditional and standardized aspects of such practices in parallel with the long-term, historic relationship they involve made us notice four generic dimensions of sustainable supply chain management. The first one is the strategic orientation of businesses. This dimension aspect appears as the actors included a minimizing waste culture in their daily operations. Such a way of thinking is further justified by the little economic benefits companies derive from these closed-loop practices. Then, supply chain continuity was fostered through long-term partnerships with neighbor industries with the development of these relationships. Finally, although evidence regarding the extent of such practices is lighter, participants 2 and 4 displayed collaborative and pro-active behaviors in their way of developing their closed-loop operations together while fostering innovation in the treatment of their wastewaters.

4.1.2. Intensive Agriculture

Even if no breeder was interviewed regarding these issues, most processing interlocutors partially integrated their farming operations and further developed practices to mitigate the risk of over-polluting activities up their supply chain.

First, it is important to mention that when participants 1, 2, and 3 highlighted their responsibilities towards the sustainability of their upstream partners' operations, participant 4 mentioned themselves as facing tough economic constraints, which followingly pushed them to focus on price, quality, and

delivery capabilities of their suppliers. One can therefore see that as a potential piece of evidence of the long-term sustainability-oriented strategy of some industry actors (c.f., Beske et al.'s orientation dimension). However, participant 4 highlighted the important economic tradeoff when sourcing raw materials with a pure ecological and social purpose, which prevents some operators from behaving as such.

Two main sets of practices were implemented by the participants, hence, allowing them to responsibly purchase their products. In the first place, all the participants pointed out the emergence of sustainability-oriented labels, like Belbeef (cattle-specific label mentioned by participants 1,2,5, and 6), or Pré de chez Nous (mentioned by participant 1). The role of these labels in the purchasing context is two-folded. On one hand, such a tool is used as a sustainability monitor imposing strict codes of conduct for breeders and allowing downstream partners to ensure the practices employed upstream are appropriate. Belbeef, for instance, encompasses the majority of breeding activities by including sustainability criteria based on livestock feeding, pasture management, biodiversity, and many others (participant 6). On the other hand, participants 2, 5, and 6 further described these labels as communication tools allowing breeders to disclose the sustainability of their operations to both downstream partners and general consumers. Relating to Beske P. et al.'s framework, the creation of such tools is a perfect example of risk management practices simultaneously allowing processors to properly select their upstream partners and ensure continuity across the value chain.

In the second place, participants 2 and 6 put forward additional integrated practices put in place to accelerate the breeders' evolution to meet the strict standards included in these labels. Indeed, participant 2 highlighted the membership of their upstream organization to a collaborative body of breeders in which they anonymously disclose their sustainable performance measures to jointly find solutions to ameliorate the outcome of their farming operations. The goal of such an organization is to enable breeders to satisfy the new codes of conducts. As advocated by participant 2, having vertically integrated parties involved in such associations allows the participation of downstream actors to the evolution process. In addition, the federation represented by participant 6 also allows discussions among relevant actors (farmers, scientists, etc.) to share knowledge and collectively address sustainability issues. While these processes are strong evidence of a proactive behavior (especially, fostering learning and innovation) from some actors, the majority of industrial processors interviewed did not show direct implications in such systems.

4.1.3. Industrial Pollution

Individually speaking, every actor engaged in green technology choices to ameliorate the ecological footprint of their operations. The main choices belong to set 2 of the green technology choice theory explained earlier, namely, the selection of energy sources. Indeed, while participants 2, 3, and 5 launched projects to partially replace their current source and sustain their energy needs using solar energy, participant 4 opted for wind turbines. Moreover, participant 2 deepened their innovative thinking by implementing a CO₂ internal plant to partially recycle their emissions and use them for internal water heating processes, which is part of the first set of green technology choices.

However, regarding their energy transition, whereas participant 2 proactively implemented the change 15 years ago, which allows them today to fulfill 10% of their total energy needs with solar energy and the rest with renewable energy, the others' projects are still pending for approvals and subsidies to get started. This situation can therefore display some lack of proactivity (specifically, innovation) from most interviewees. Then, although we could notice the growing will of participants to find alternative energy schemes to power their operations, participants 1, 3, 4, and 5 admitted that such projects were primarily discussed for economic purposes, given the dangerously raising costs of conventional energy

sources. Hence, the strategic orientation dimension of generic sustainable supply chain management practices can also be questioned in that case as interviewees seem to undertake such plans in reaction to the upcoming economic constraints instead of having proactively launched such plans earlier.

In addition to changing their energy sources, the actors also engaged in green inventory practices to diminish their industrial pollution. Specifically, participants 1, 2, 3, and 4 mostly run just-in-time operation schemes, to minimize their inventories and principally furnish fresh meat to their customers. Such processes therefore diminish the use of refrigerating gas and the ecological impact of inventory maintenance.

Besides the economically driven justification provided by participant 4, stating that Walloon players were not big enough to be the leaders of the industry in terms of innovation and needed external help to adopt more proactive action plans, other barriers to their energy transition were highlighted by the interviewees. Specifically, participants 2, 3, and 4 pointed out the slowness of the administrative process to launch such projects and the huge upfront investment they still represent, hence, making subsidies necessary. This opinion was also backed up by participant 6 (federation), who indicated a lack of coordination between the authorities and the industry. Specifically, the interlocutor highlighted the lack of economic aids provided in the sector and the complex stratification of the system strongly enlengthening the administrative approval processes.

Finally, participant 6 also mentioned the intention of their federation to address such ecological issues from an industry-wide perspective. Indeed, the actor mentioned their long-term relationships with scientists and researchers to unveil opportunities to weaken the operators' environmental impact. Nevertheless, although such processes appear as a sign of proactivity, the project of diminishing the entire industry's energy consumption is still in a phase in which the relevant players' environmental performance must be commonly evaluated before setting industry-wide targets and best practices.

4.1.4. Packaging

While participants 2, 3, 4, and 7 claimed selling all final products in either recyclable or reusable secondary packaging, participant 1 said their products still needed a certain amount of processing and were transported in refrigerated trucks without being packed. Additionally, as it was confirmed by participant 2, 3, 4, and 7, the first trigger to develop their products came from the very downstream retailing partners. Consequently, one could think the strategic orientation behind the choice was therefore not necessarily oriented towards sustainable performance although the change seems to have been quickly adopted through the sector.

4.1.5. Logistics-Related Pollution

Two main aspects of the Walloon actors' logistics operations attracted our attention throughout the interviews.

First, relatively highly developed green logistics practices were displayed by the participants. On their side, interlocutors 2 and 4 integrated downstream logistics partners, each of them having a fleet specialized in cold chain logistics able to more than fully support their respective distributions on the Belgian market. Subsequently, the lastly quoted parties enjoy long term relationships with neighbor industry operators, which gives them the opportunity to collaborate with them and achieve grouping to maximize truck loading. Regarding interviewee 1, their organization participates to such processes but does not have a contractually integrated transportations operator. They then take part to

collaborative operations thanks to the long-term relationships they enjoy with a neighbor processor who is integrated downstream.

In addition to demonstrating high standards in green logistics operations powered by strong supply chain continuity (long-term relationships) and collaboration (joint development and logistics integration), these players together with participant 6 also mentioned the aligned economic and ecological goals of these processes (c.f., strategic orientation) that are today considered as standardized.

On the other side, participant 3 has two trucks only used for close customers. They consequently mostly rely on third parties for distribution and do not yet put downstream logistics optimization in their priorities, which unveils lateness from some players regarding this subject.

In addition to optimizing their logistics operations, participants 1, 2, 4, 5 also highlighted their optimal geographic location and the Walloon network as strong sustainability-oriented assets for the meat industry. Indeed, all the interviewed participants were concentrated around strategic points together with other operators (counting always at least one slaughterhouse). Thus, the distances traveled to group products and fully load the vehicles are neglectable and the transports of fresh meat from slaughterhouses to the processors' plant sometimes don't even require the usage of trucks. For instance, a high level of collaboration and partner development was displayed by players 1 and 5, who established a "tunnel" network to facilitate the transports of dead animals across their plants. Additionally, participant 2 also sees their geographic location as an opportunity to collaborate with industry peers, as they use semi-processed pork products from a neighbor company without incurring additional transportation costs.

To conclude this paragraph, such a green facility plant location tends to strongly enhance the environmental performance of the interviewed actors. This advantage is also intensified by long-term relationships and the high level of collaboration that were developed between operators.

Finally, less information was gathered considering upstream transportation. However, one can assume such a network allows the consolidation of livestock transports as long as the animal well-being is respected. Furthermore, participant 6 advocates that in the current standards of animal well-being, the Walloon network is too geographically restrained for animals to suffer from excessively long transports journeys.

4.2. Social Issues

4.2.1. Traceability, Food Safety, Hygiene

Traceability and hygiene being legally regulated, all the interrogated players met the standards enforced by the F.A.S.C.A. Given the fact that they are individually held accountable for this aspect of social responsibility, every player has their own practices. Furthermore, each participant defined traceability features of the Belgian industry as a strength compared to other countries.

Such statement may result from the numerous actions taken in the sector to surpass the minimal standards imposed through legal requirements. To achieve that, important risk management practices were put in action by the interviewees. First, the interviewed processors together with the retailer implement individual monitoring practices, hence, by performing personal audits of their respective upstream partners. However, most relationships have been strengthened through time and actors are confident regarding the fact that their direct partners share their vision regarding social responsibilities like this. Second, labels like Belbeef or Pré de chez Nous set standards even higher across the value network and involve additional auditing from external parties. They can therefore be further seen as

supplementary risk monitoring means in addition to their other roles mentioned in the previous findings.

In addition to these controlling tools, technological innovations also enhanced the traceability practices of the actors. Specifically, every interrogated actor (except the federation) successfully implemented their own ERP software to facilitate the transfer of traceability information. Therefore, such a practice can be considered as well-installed in the sector, even though smaller actors are slower to adapt or do not have the funds to adopt these technologies (interview participant 6). Moreover, federations and large-scale distributors cooperated through the Belbeef label by providing the agreed members an external platform centralizing their individual traceability data to better exchange information and foster discussions in case issues are detected.

Conclusively, traceability and food safety seem well-advanced in the sector as it is further enhanced through strict monitoring tools together with the use of technologies like ERPs. Hence, representative examples of social-sustainability-oriented risk management practices can be found in the sector. Furthermore, participant 6 together with retailers proactively pushed the role of ERPs further than their initial vertical traceability purpose by turning them into a key collaboration tool connecting actors together across the whole network.

4.2.2. Animal Well-Being

In addition to meeting the animal well-being legal requirements enforced by the Walloon Region, the majority of interviewed actors engaged in complementary risk mitigation practices across the chain.

First, as a recall, labels such as Belbeef, or Pré de chez Nous both include high-standard control points in the codes of conducts they imply (interview participants 1, 2, 6). Additionally, the presence of such labels oriented towards the well-being of pigs has also been mentioned by participant 4.

Then, interlocutors 1 and 2 confirmed that they perform individual monitoring activities at both farming and slaughtering stages, which are facilitated by their upstream vertical integration. They further highlighted the long-term relationships of trust they experienced with the breeders and slaughterhouses. In contrast, player 4 does not have direct contact with breeders but also put forward their “privileged” relationship with their slaughterhouse. In the same fashion, participant 5 (slaughterhouse plant manager) insisted on the constant video monitoring and the recurrent audits (external, or from downstream actors) they were subject to. Furthermore, the participant claimed to be responsible for auditing the transporters bringing livestock to their facilities. In opposition to these actors, participant 3 (lamb industry) are mainly furnished by foreign companies and have no contact neither with slaughterhouses nor breeders. They therefore rely on foreign labels without performing individual monitoring activities.

The Walloon cattle industry therefore seems to have implemented an intense web of controls across the concerned actors, which is strengthened by the long-term relationships of trust existing among value chain actors (continuity). Furthermore, from this evidence, one could observe a gap between the practices employed in the cattle industry and the ones used in the pork and lamb industries. However, less information was obtained from actors of these specific sub-sectors and these results should be cautiously read. Furthermore, Wallonia being fully autonomous in terms of bovine meat (participants 2, 5, 6), most of the raw materials are locally sourced and easier to control.

In addition, the application of animal well-being policies appeared as deeply anchored standards in the daily processes performed by participants 1, 2, and 5. The strategic orientation dimension of sustainable supply chain management is therefore recognized here and is increasingly visible through participant 1’s statements regarding this subject. Specifically, the interviewee insisted on the obvious

positive relationship between the processors' product quality (and therefore the breeders' productivity) and animal well-being.

Finally, participant 6 claimed the role of their federation in the exercise of adapting the standards in the regulations and other codes of conduct in case a problematic is encountered in the industry. Indeed, the interlocutor put forward their interactions with relevant actors (animal well-being agencies, scientists, breeders, politic, etc.) to answer the emerging problems and set up regulations to adjust every actor's behavior. Such a proactive learning behavior is also assumed to enhance the sustainable development of the sector.

4.2.3. Local Sourcing

Before detailing the measures taken by the Walloon actors to localize their supply in Belgium, or even in Wallonia, it is important to distinguish the cattle, pork, and lamb subsectors regarding that subject.

Whereas participant 6 pointed out the autonomy of Wallonia regarding beef, it was clarified earlier that it was not the case for pork and lamb meat. Therefore, treating this issue becomes less relevant for participants 3 (lamb) and 4 (pork). This idea is further strengthened by interlocutors 5's discourse, claiming that pork consumers are more open and less focused on the "local" dimension. Then, while participant 4 still source their pork meat in neighboring countries, the interrogated lamb producer (participant 3) completely omits this point as their consumers do not seem sensitive to that subject. The interlocutor attempted to further prove this point with an example of large-scale retailer requiring solely lamb from New-Zealand in their code of conduct.

On the other hand, participant 5 described local sourcing as more important in the cattle meat sector, in which supermarkets generally require local products of race "Blanc Bleu Belge" through their codes of conduct. Such a statement was confirmed by participant 7 (retailer), who put forward that in order to meet the current customers' expectations, their supermarkets ensure that the beef products proposed are locally sourced through contractual specifications. Upper in the supply chain, the processors interviewed appeared to have local sourcing policies deeply embedded in their culture and strategies. Indeed, this perspective is further visible through their vertical integration of local farmers and their purchasing policies focused on products certified by local labels. Furthermore, both players highlighted their long-term relationships with local breeders together with the traditional aspect of the Walloon sector, which is, in their opinion, characterized by long-lasting partnerships between breeders and downstream actors.

Relating this feature to the generic sustainable supply chain management practices framework, we could observe a strong culture and strategic orientation of actors towards local sourcing, coupled with deep supply chain continuity (long term relationships with local breeders). Furthermore, this culture, which is almost a typical characteristic of the Walloon industry, is further preserved and ensured throughout the chain via risk mitigating strategies such as the use of labels and codes of conducts.

4.2.4. Social Reputation and Workforce Skills, Sufficiency, and Age

These two issues have been addressed together by the actors and are consequently paired in this analysis section. Precisely, all interlocutors pointed out the workforce decline the breeding and processing players are currently experiencing. Subsequently, the majority of interlocutors (1,2,3,5, 6) described today's state of the industry as a direct consequence of the reputational downturn they faced in the last decade. Therefore, although the players of concern found short-term solutions to address the problem now (which will be exposed further), they believe straightening people's opinion of the sector will be necessary to ensure its economic viability in the long run.

Hence, regarding the industry situation in the short run, it is first interesting to state that processing participants qualified their practices as traditional but requiring a high set of skills. After, two distinct situations were unveiled throughout our discussions with participants. On one hand, participants 1, 3, and 5 are currently hiring foreign employees via third party agencies and followingly designed intense training programs in order to keep their traditional methods and quality standards. On the other hand, participants 2 and 4 noted that the local meat-processing businesses were tied to the domestic population's culture (and part of their traditions). Consequently, both actors employ local staff showing a high level of skills and engagement towards the companies and their historical values. This aspect can be considered as a strength relatively specific to the Walloon red meat industry as it might be powered by its traditional character and the high concentration of players around central geographic locations. However, although this visible strategic orientation towards traditions and the strong continuity in the red meat value chains (i.e., long term partnerships and partner selection) displayed by participants 2 and 4, the reputational damage inflicted to the industry still hurts the entire value network and makes its future uncertain.

The most recurrently solicited tools to resolve the reputational problem faced by the industry are the labels, which were commonly validated by all the participants of this study. Indeed, as already stated earlier (retrieving the words of participant 6), labels are heavily used in the sector as a communication tool for the operators (from breeding till processing stages) to reveal the sustainability of their practices to the public. Using the proposed generic solutions framework, one could therefore qualify such a use of labels as a risk management practice to manage pressure groups able to hurt the industry. However, even if these labels are used as such, the interviewees (specifically, participants 1, 2, 5, 6, and 7) still witness the ongoing problematic and further describe the public's view of the Walloon red meat sector as erroneous.

Indeed, a general feeling from the cattle industry interviewees was that the sustainability debate involving the Walloon sector in ecological or animal well-being polemics lacked some perspective and objectivity. Indeed, participants 1, 2, 5, and 6 pointed out that most information diffused to society was focused on wrong, unsustainable practices that are generally not supported in the traditional processes implemented in the Walloon meat sector. In their opinion, breeders, processors, or other affected parties pursuing traditional and professional methods (hence, the majority of Walloon breeders) are targeted in the same way as (and suffer more from the situation than) the "worst practitioners" employing intensive farming and alternative productivity boosting processes (participants 2, 5, and 6). According to the participants, this element is a crucial cause of the general reputational downturn in the industry and must be addressed jointly with external institutional actors to make the sector viable for the future. Although it has been firstly answered using labels, actors are calling for additional solutions given the lack of progress they experience regarding that dimension.

4.2.5. Food Losses and Waste

Given the different responsibilities of the participants, food-loss-related practices will be analyzed before the ones for food waste.

Regarding food waste, two different situations were exposed in the interviews. First, participants 3 and 4 engaged in food loss management practices, hence, attempting to process as much as possible the defective products still suitable for human consumption to in fine sell them at cut prices via alternative channels. Specifically, the actors claimed these secondary distribution streams were established years ago and involve sales to food banks or employees. However, whereas interlocutor 3 confirmed fully processing wrongly cut lamb pieces to further distribute them, interlocutor 4 claimed not being able to incur high processing costs to not sell products at their full price. Consequently, the earlier the

production mistake is made, the less likely they are to process the goods and send them to their alternative channels. Such economic constraints can therefore lead some actors like participant 4 to generate major amounts of food losses.

Second, interviewee 2 adopts a more preventive strategy, basically operating on command for their customers. Such a pull system therefore leads participant 2 to maintain low stocks while avoiding planning failures. Unfortunately, the actor did not mention the procedure applied in case mistakes were made during production. Besides, interlocutor 1 employed a hybrid strategy, facing highly recurrent demand, which allows them to accurately plan their production, and employing secondary processes like cooking to redirect the defective products to alternative challenges.

Finally, food waste was addressed by our retailing participant, who claimed this dimension to be tackled in supermarkets through dynamic pricing and demand planning policies that are constantly evolving. The actor further pointed out the already implemented A.I. and machine learning technologies to adjust prices and the ongoing research undertaken around these. Finally, the interlocutor also highlighted the relationships they maintain with food banks and other food-security-oriented associations.

In conclusion, the culture of Walloon red meat actors towards food losses, is well-reflected in their food loss management and prevention processes at every stage of the chain. Especially, soliciting alternative value streams in that case positively contributes to the local food security challenges. Furthermore, the continuity of this culture is ensured in their network through the long-term relationships participants have with alternative buyers. However, the main barrier to such management processes were the economic constraints such operations could represent for the actor, as described by participant 4.

4.3. Economic Issues

4.3.1. Low Margins

Various sets of practices to increase the breeders' margins were highlighted throughout the discussions.

On one hand, regarding upstream initiatives, the majority of participants pointed out the associations of breeders aiming at strengthening their bargaining power and charge higher prices for the downstream actors. Furthermore, participant 2 claimed the preference of final downstream distributors for lower-priced products also acts as a trigger for farmers to push their profits even lower.

Large trade unions of local breeders may therefore ameliorate their economic situation and can be framed in the collaboration dimension of Beske P. et al.'s framework as they permit the joint development of actors.

On the other hand, participant 2 highlighted the highly fragmented format of the Walloon red meat supply chain as a cause of the low margins generated by upstream actors. Various practices have therefore been identified at breeding and downstream stages to increase the value added by upstream farmers. The main one put forward by participants 1 and 2 was the vertical integration of upstream actors to empower them and fairly remunerate their services. Then, interlocutor 2 developed further their upstream partners by financing their activities to go further down the chain and increase the added value of their activities (and indirectly, their margins). Finally, participants 2, 5, and 6 mentioned the increasing number of direct marketing channels through which farmers could directly sell final products to end customers. The actors described the volume of these activities as still low today, but already allowing the breeders to improve their overall profitability.

In the end, upstream actors seem to be coherent with their responsibilities towards breeders that they already claimed when addressing the intensive agriculture and reputational downturn concerns. Specifically, through integration and other methods, industrial producers empower the upstream actors of the network, which correspond to the partner development practices highlighted in the collaboration dimension of the generic framework. However, such investments do not seem well spread across the sector and the farmers remain dependent of downstream actors until the very end of the chain regarding the prices they set, which might still hurt their conditions in the long run. We therefore believe supplementary efforts could be furnished on that aspect.

5. Discussions

The interviews performed for this thesis revealed promising behaviors from Liege's red meat sector actors regarding their sustainable development. Indeed, results shed light on the value network structure enabling advanced operational schemes favorizing the Triple Bottom Line performance of the industry. The most important characteristics of the studied sector lied in the continuity and collaboration dimensions of sustainable supply chain management practices proposed by Beske P. et al.

We believe the strong continuity across the network was built through the high level of interconnectedness among actors, who maintained long-term close relationships with the majority of their contractors across their supply chains. The establishment of such a network therefore allowed the participants to benefit from these partnerships by undertaking vertical and horizontal collaborative projects. Specifically, this research unveiled long-lasting joint development and integration projects contributing to the improvement of the sustainability of the chain's operations. Through that sentence, we point out the main sustainability-friendly industry practices powered by the traditions embedded in Liege's red meat network. Hence, we include in this list the complex development of a closed-loop supply chain, the establishment of a smart logistics network reducing food kilometers and generating interesting cooperation opportunities, the empowerment of smaller upstream actors, the traditional farming methods generally employed in Wallonia, and the engagement of local populations towards the sector. Additionally, we could witness that such features were deeply anchored in the sectoral traditions and were therefore highly standardized across the web of breeding and processing businesses.

After that, we identified the evolving labels and codes of conducts as well-elaborated risk management tools. On one hand, in addition to the generally accepted and standardized individual auditing practices, they foster all players' sustainable development by pushing them to meet higher standards via communication means that are already part of their routine operations. On the other hand, we considered such tools as promising communication channels to enhance the sector's reputation from the pressure groups' perspectives although further improvements could be brought for that purpose.

The participants' traditional behaviors therefore showed strongly encouraging results regarding the industry's sustainable development. Nevertheless, complex barriers and unsolved issues have then been identified on the other side of the analysis process.

First, the traditional mindset and the corresponding aspect of the interviewees' operations also seems to have generated downsides along the remaining dimensions of sustainable supply chain management framework, which in turn slowed down the operational progress of the whole sector. On one hand, the habit of sticking to old-fashioned practices, although they may globally be more sustainable, seems to have hindered the participants' proactive behavior, and more specifically, their innovative potential. Indeed, while the players recurrently put forward the advantages of the traditional practices employed throughout the Walloon industry, a majority seems to have missed the

timing to take necessary measures to foster the sustainable evolution of the activities across their network. This situation emerged in the industrial-pollution-related discussions, as participant 2 was the only party having already implemented greener energy infrastructures.

Furthermore, this lack of proactivity also appears in the strategic orientations displayed by the interlocutors. Indeed, the focus towards future was not generally present in the participants' cultures. Globally, no long-term, sustainability-oriented objectives (like for instance, the Sustainable Development Goals proposed by the UN) were included in their respective strategies. Such statement is further made observable by the much deeper development of risk management strategies employed in the sector, compared to the levels of innovation that were observed through the research. Indeed, this lets us believe that the interviewed players adopted a reactive behavior rather than a proactive one. They may have missed some proactive opportunities in the past, and today suffer, as they have to quickly adapt their operational schemes to regulations and external pressures, rather than launching projects thinking forward.

Even if some underdeveloped proactivity from players themselves has been highlighted, external obstacles also undermine the actors' ability to adapt and contribute to the sustainable evolution of the Walloon red meat industry. Indeed, the legislative system set up to facilitate the industry's progresses displays some incoherences if we take into account the external social actors' ambitions towards national sustainable development. Precisely, dysfunctional coordination between actors and the legal environment is recognized through the length of the administrative approval process when launching sustainable initiatives. For instance, participant 6 pointed out a well-known industry actor that has been waiting for 8 years for the approval process to be finalized before putting their plan in action. Furthermore, several actors showed their limited economic means to undertake such proactive projects, due to the current economic context and the inherent tight margins achieved by all actors in the industry. We therefore can question the system's ability to foster sustainability opportunities for the actors through the use of subsidies.

In order to ameliorate the innovative potential of the sector, efforts will need to be furnished on both sides of the balance. On one hand, we recommend the actors to modernize their vision (strategic orientation) by including long term, sustainability-focused objectives in their strategies and intensifying research for that purpose. Such changes could lead them to refer to external frameworks like the Sustainable Development Goals program proposed by the United Nations. The expected result of this shift would be that the relevant parties end up being able to anticipate the future sustainability-related challenges and preventively develop and adapt themselves. Furthermore, the actors would then share common public goals with broad societal actors, which would better frame the discussion among relevant parties. However, in order to coordinate their efforts, the administrative systems and the aids available for the actors should accelerate their way towards the objectives commonly set rather than slowing them down.

In addition to this lack of proactivity, the declining social reputation of red-meat sector actors was identified as an unsolved issue. Throughout the interviews, we understood that the traditional aspect of the previously described standardized sustainable practices implemented in the industry could undermine their exposure to the public. Indeed, the fact that closed-loop operations, green logistics, traditional farming, and many other widely implemented practices of the Walloon sector were recognized as industry standards seems to have led to a lack of exposure of such processes in the sustainability debate ongoing in the red meat sector. Indeed, while the main criticisms target players over-focusing on productivity (hence, undertaking intense farming and intensively consuming industrial operations), the majority of Walloon actors employ traditional methods described as "good practices" by the participants.

Although the objectivity of such a discourse can be questioned, we still believe that the ongoing public debate inherently puts the industry in a weak position. Context should therefore be brought in the discussions, identifying and assessing the local actors' practices in relation with the entire meat industry and the "wrong" practices extensively signaled by external pressure groups. Furthermore, even though labels are heavily solicited in the network to disclose Walloon actors' sustainable practices, their effects on the public's perspective do not seem conclusive as of today. Additional efforts should therefore be brought to augment the visibility of such tools in the customers' eyes.

Finally, the poor financial situation of upstream farmers is still a serious problematic of the sector with the potential to deeply affect its long-term sustainability. While we noticed a relatively high level of collaboration and empowerment opportunities between breeders and industrial processors, an important gap was still recognized with the large-scale retailers (supermarkets) at the very end of the value stream. Combining such a situation with the fact that all participants claimed supermarkets to be the most powerful actor of the chain regarding the prices and codes of conducts, a closer connection and enhanced contacts between them and the very first suppliers would therefore set the path for discussions to ameliorate the margins of the sector. Furthermore, shortening the supply chain that is currently highly fragmented could also improve the key players' margins. This would then involve decreasing the actors' reliance on merchants and wholesalers to foster more direct relationships with farmers. Participants 1 and 2 already set the path for such behavior, which could be more widely adopted throughout the meat value network. Also, such an important structural change would require efforts from all types of sectoral actors, namely, breeders, processors, and retailers.

6. Limitations

The first major weakness of this study lies in the absence of some sectoral actors within the sample. Specifically, the absence of breeders could eventually weaken the relevance of this paper. Indeed, farmers are necessary upstream players at the center of several arguments with the public and even other operators downstream. Even if the sample included vertically integrated actors, and even if the thesis was focused on general sustainability-oriented supply chain practices in the industry, including breeders would have given deeper insights on the actors positioned in the "worst" spot in the conversations.

Followingly, the sole inclusion of industry-related actors in the sample of such a qualitative study can also be considered as a source of bias in the results. Indeed, the weak position of the sector in the sustainability debate can push interviewees to adopt a defensive behavior, lacking objectivity in their discourse.

Then, this work provides an analysis of Liege's entire red meat sector, hence, involving actors from the beef, lamb, and pork subsectors. Although important similarities can be highlighted in the operations undertaken by these companies and the similar structure in each value network, the difference in supply practices and regulations (as industry-specific bodies are not the same in each sector and the pork industry is subject to different animal well-being regulations) can affect the companies' positions in the sustainable development discussions.

Finally, the sustainable supply chain management practices included in the analyses of this thesis were general methods unspecific to a food system. Hence, some additional accuracy could be found by assessing the use of sustainable food-system-specific practices in the meat sector.

7. Suggestion for Future Research

As it was already requested by the interviewed actors, the situation of the Walloon market in the sustainability-related polemics associated with red meat needs to be re-defined. In order to objectivize

the debate and replace the Walloon farmers and processors' practices in the right context, scientific studies should be proposed to highlight the worse and best practices available in the sector (in terms of sustainability). Then, the literature relating to the subjects discussed in this thesis generally proposes qualitative studies based on input provided by only one side of the debate. A strong first step towards building an objective picture of the Walloon market's sustainable development would then involve a quantitative study built around strict, objective metrics to measure the relevant parties' sustainable performance along the dimensions put forward by their pressure groups.

Subsequently, the metrics could be subject to a benchmarking task built around average or target numbers. This research should be used as a reference and include a comprehensive sample of the industry. Through such approach, the actors' sustainability results would also be objectivized and the difference among them could be tied to the different "good" and "wrong" practices they employ.

In order to complete the overall picture of the sector, individual studies focusing on specific actors could also be conducted to evaluate the technical aspects of sustainable operations and strictly measure their outcomes. Hence, having a comprehensive and objective food system performance image coupled with technical requirements for every actor could set the path to accelerate the sustainable development of the industry as a whole.

Finally, we suggest performing supplementary proactive studies aiming at identifying the most relevant sustainability challenges and leverage points in the future for already setting the path for companies to align their objectives with external organizations.

8. Conclusion

The goal of this study was to reveal and assess the efforts provided through Liege's red meat industry to address the current sustainability challenges the actors have had to confront lately.

In order to achieve that, we performed semi-structured qualitative interviews among 7 actors carefully chosen following the Double Bell representation of the studied area. Specifically, the sample counted one slaughterhouse, four industrial processors (focal point of the research) covering each major red meat type, one large-scale retailer, and one industry-related federation. Furthermore, the interviews were designed according to the environmental, social, and economic issues of the sector initially found in the literature.

Followingly, we framed our findings according to the hypothetical operational and generic sustainable supply chain practices to evaluate the actors' daily practices and more particularly the whole sector's behavior towards the sustainability challenges they consider. Hence, the results of this study revealed sustainable practices deeply embedded in the industry's traditions. Specifically, the high level of continuity and collaboration across the network coupled with their efficient logistics web seem to be the strongest arguments of the industry in the sustainability debate. Unfortunately, such traditional practices still lack publicity and exposure, making external communication a key leverage point to heal the current social reputation of the sector. This element is one of the main reasons that should push scientific players and external bodies to objectivize the debate around the red meat industry and put the practices employed by the Walloon actors in perspective relative to the practices initially targeted by the criticism.

Nevertheless, while some encouraging practices were identified, the lack of proactivity and innovativeness is still considered as a crucial improvement point to straighten the future vision of the industry. Although the players set up powerful risk mitigation strategies, we highlighted the importance for industry operators to clarify long-term sustainability objectives together with external pressure groups and authorities. Moreover, the legal context and external aids provided should enable

the acceleration of innovative projects launched by the actors in order to remain coherent with the high-level objectives pointed out.

In a nutshell, the traditional aspect of Liege's red meat sector is its main strength and weakness. On one hand, the fact that old-fashioned, sustainable practices were not recognized by the public pushed actors against the wall and put the sector in a defensive, reactive position that led to a strong focus on justifying current practices. On the other hand, by over-sticking to the traditions and over-defending them, we believe the majority of the industry has lost sight on future challenges, which undermined their innovation capabilities. Hence, both sides of the debate should jointly put effort in the recovery of the sector that is still in decline.

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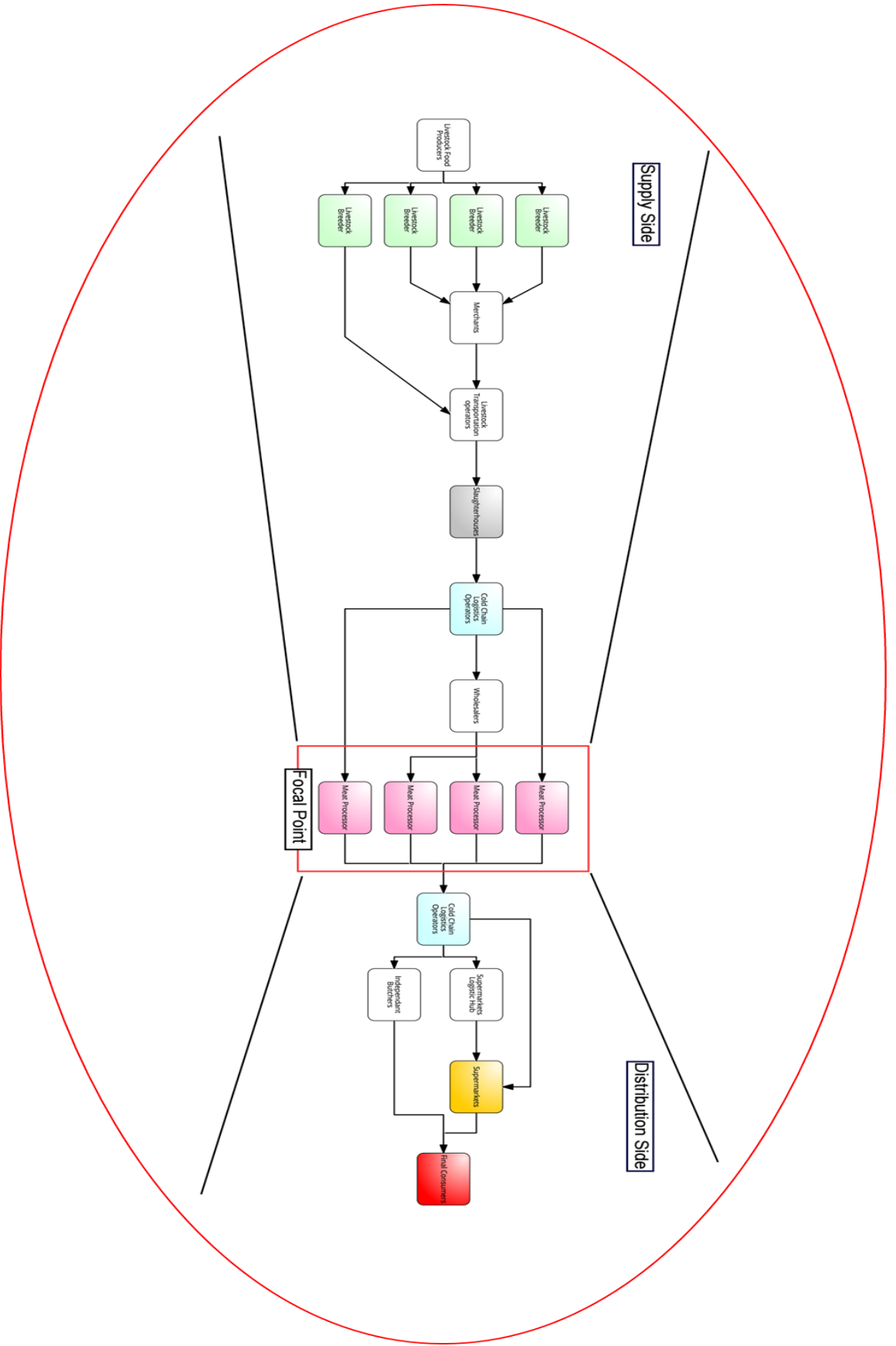
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10. Appendix

Appendix I

Broad Social Stakeholders Environment, Involving European, National, Regional
Legislative Bodies, Industry-related Federations, and society in general



Appendix II

Interviewee	Position in Organization	Activities of the Organization	Meat Sub-Sector	Domestic Sales	Vertical Integration
Participant 1	Finance and Order Planning	Meat Production and Processing	Cattle	100%	Up (Farming) and Downstream (Logistics)
Participant 2	Director and Board Member, Director of an industry-related federation	Meat Production and Processing	Cattle and Pork	85%	Up (Farming) and Downstream (Logistics)
Participant 3	Production and Quality Manager	Meat Production and Processing	Lamb	« Around 80% »	Upstream (Farming)
Participant 4	Supply Chain Manager	Meat Production and Processing	Pork	60%	Downstream
Participant 5	Plant and Quality Manager	Slaughterhouse	Cattle	100%	/
Participant 6	Managing Director	Federation	Cattle	/	/
Participant 7	Chief Butcher	Retail	All	/	Upstream (Logistics)

Appendix III

Interview Scheme

Bonjour Monsieur, je voudrais d'abord vous remercier pour l'heure que vous m'accordez afin de faire cette interview. Mon mémoire vise en fait à analyser le comportement du secteur viande rouge du bassin liégeois vis-à-vis des challenges existants en termes de durabilité. Mon objectif étant d'acquiescer une vue d'ensemble du secteur, je tente d'obtenir des interviews avec des acteurs à plusieurs niveaux stratégiques de la chaîne de Valeur. Je suis donc persuadé que votre point de vue peut rajouter du poids à mon étude et la rendre plus pertinente.

En ce qui concerne les challenges relevés dans les questions, je les ai repêchés dans la théorie à travers mes recherches. N'hésitez donc pas à m'interpeler lorsque l'un d'entre eux devrait être exprimé autrement ou serait moins pertinent dans le secteur wallon. Dans l'autre sens, si j'en ai oublié un ou même plusieurs, je suis évidemment enclin à les aborder de la même manière que ceux initialement mentionnés dans l'interview.

Avant de commencer, je voulais également demander si vous me permettriez d'enregistrer cette discussion afin de la retranscrire dans mes notes ? D'ailleurs, si vous désirez ou s'il est plus simple pour vous de rester anonyme dans mon mémoire, je m'adapterai sans problème.

Contexte		Informations Générales sur l'Entreprise
		Quel est le chiffre d'affaires actuel de l'entreprise ?
		En quelle année a-t-elle été fondée ?
		Sur quels marchés êtes-vous les plus présents ?
		Quelle est votre fonction au sein de l'entreprise ?
		Quelles sont les valeurs mises en avant par l'entreprise ?
		Informations Générales sur le Développement Durable
		Quelle est votre définition/perspective sur le développement durable ?
		Êtes-vous familier avec le concept des 3 piliers de la performance durable ? Environnemental, social, économique ?
		Cette interview est orientée vers les principaux challenges (écologiques et sociaux) auxquels doivent faire face les différents acteurs du secteur viandeux dans le bassin liégeois. Les questions suivantes porteront donc sur les activités de votre entreprise et de vos collaborateurs vis-à-vis de ces challenges.
		L'Entreprise et sa Chaîne de Valeurs
		De l'éleveur jusqu'au consommateur final, pourriez-vous me synthétiser la chaîne de valeurs dans laquelle vous opérez en expliquant brièvement les rôles des divers acteurs en faisant partie ? (Mentionner transporteurs et acteurs institutionnels)
		En ce qui concerne votre entreprise, quelles sont les processus principaux/secondaires/sous-traités poursuivis au quotidien ?
		A quel point l'entreprise a-t-elle verticalement intégré ses opérations ?
		Quels sont vos principaux fournisseurs (éleveurs/abattoirs) ? Comment qualifieriez-vous votre collaboration et le rapport de force avec ceux-ci ? Est-ce que vous voyez une forme de responsabilité commune avec eux vis-à-vis des défis du développement durable ?
	Idem mais avec les clients	
	Issues	Durabilité du Secteur Viandeux
Environnementale	Drivers	Quels facteurs vous poussent à implémenter certaines pratiques durables et à évoluer dans ce sens ? (Régulations, coûts, pression de l'opinion publique, compétition, etc.) Ces facteurs poussent-ils vos concurrents/collaborateurs à aller dans la même direction et à poursuivre des objectifs communs ?
	Waste Disposal	- Quels sont les principaux déchets matériels générés lors de vos opérations (eau, restes, ...) ? Quels procédés sont mis en place pour minimiser/traiter ceux-ci ? Des politiques sont-elles instaurées au sein de votre Supply Chain (par vous ou acteurs tertiaires) pour gérer cet aspect de manière intégrée (en prenant en compte le fait que les autres acteurs génèrent également leurs déchets) ?

	Industrial Pollution	- La pression de l'opinion publique monte vis-à-vis des émissions polluantes ainsi que la consommation d'énergie générées par les activités industrielles en général. En rajoutant à cela les coûts grandissants de l'énergie, avez-vous un plan visant à diminuer cette consommation d'énergie sur l'étendue de votre Supply Chain/de vos opérations internes (ou suivez-vous un schéma proposé par un acteur externe) ?
	Intensive Agriculture	- Les éleveurs ont été mis sous pression ces dernières années pour leur consommation intensive de ressources (terres, nourriture, eau, ...). Ce facteur pouvant impacter l'emprunte environnementale des produits finaux est-il pris en compte lorsque vous choisissez vos fournisseurs ? Avez-vous un plan d'action en commun avec les éleveurs vis-à-vis de ce challenge ? Comment contrôler cet élément ?
	Packaging	- Le packaging est également vu comme un élément pouvant être polluant des chaînes de valeurs dans l'industrie de la viande. Des pratiques communes ont-elles émergé au sein des acteurs visés pour adresser ce « problème » ?
	Logistics-Related Pollution	- La pollution liée au transport de produits au sein de la Supply Chain est également une source importante d'émissions polluantes. Développez-vous votre réseau logistique en prenant en compte l'objectif de minimisation de ces émissions (avec l'aide d'acteurs extérieurs) ?
	Other Challenges	- Il y a-t-il d'autres challenges que vous aimeriez relever dans cette catégorie ?
	Obstacles	- Quelles sont les principaux obstacles dans l'implémentation des pratiques durables évoquée précédemment ?
	Issues	
Sociale	Drivers	Quels facteurs vous poussent à adresser les challenges sociaux d'aujourd'hui ? Ces facteurs poussent-ils vos compétiteurs/collaborateurs à aller dans la même direction et à poursuivre des objectifs communs ?
	Traceability & Hygiene	- Comment assurez-vous la traçabilité des produits ainsi que l'hygiène employée lors de leur manipulation à travers votre chaîne de valeur ? Les responsabilités sont-elles partagées parmi les acteurs de la chaîne de valeur ? Comment contrôlez-vous cet aspect de la Supply Chain ?
	Animal Well-Being	- Le bien-être animal est un sujet au centre de nombreux débats en ce qui concerne les opérations du secteur de la viande (particulièrement chez les éleveurs et abattoirs). A quel point les responsabilités sont-elles partagées à ce niveau ? Quelles méthodes sont mises en place pour assurer le bien-être animal au sein de votre chaîne de valeur (par vous ou certains acteurs extérieurs) ?
	Workforce Skills and Satisfaction	- Comment assurez-vous la satisfaction et les compétences du staff employé le long de votre Supply Chain ?
	Local Sourcing	- Chercher à manger local est devenu une attitude courante des consommateurs ; autant pour s'assurer de l'origine des produits que pour alimenter l'économie belge ou diminuer leur empreinte environnementale. Des politiques (collaboratives ou internes) sont-elles mises en place pour adresser ce défi ?
	Social Reputation	- La dégradation de la réputation sociale des éleveurs et des abattoirs aux yeux des consommateurs semble être devenu un problème non-négligeable pour les acteurs du secteur viandeux. Quelles pratiques collaboratives sont mises en place pour adresser ce problème ?
	Food Losses and Waste	- Le « gaspillage » alimentaire (produits jetés qui auraient pu être consommés par les humains) est un sujet également adressé dans les challenges sociaux d'aujourd'hui (étant donné la quantité de ressources utilisées dans l'industrie ainsi que la famine grandissante). Quelles sont les principales causes de la non-vente de certains produits ? Quelles pratiques sont-elles employées pour gérer ces produits/minimiser leur quantité (internes, collaboratives) ?
	Others	- Il y a-t-il d'autres challenges que vous aimeriez relever dans cette catégorie ?
	Obstacles	- Quelles sont les principaux obstacles dans l'implémentation des pratiques durables évoquée précédemment ?
Economique	Economic Implications	Quels sont les effets de ces pratiques durables sur la performance générale de l'entreprise ? Observez-vous une amélioration/détérioration de la performance financière due à l'implémentation de certaines pratiques ?
	Others	- Il y a-t-il d'autres challenges que vous aimeriez relever dans cette catégorie ?
Conclusion	Orientation for the Future	Selon vous, quels sont les points d'actions les plus intéressants/urgents (et lesquels sont les plus compliqués/moins urgents) à exploiter afin de poursuivre le développement durable de l'industrie de la viande dans le bassin liégeois ?