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EVALUATING SUSTAINABLE LOGISTICS FOR ORGANIC LOCAL FOOD SYSTEMS AND USING COLLABORATION AS A TOOL FOR RATIONALIZATION IN THE RETAIL-WHOLESALE SECTOR:

A case study in the Nord-Pas de Calais region, France

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TABLE OF CONTENTS

Abstract

Localizing the organic food system is a key element for sustaining the development of organic agriculture globally. Local Food Systems (LFS) are often attributed to having advantages but their economic, ecological and social performances are questioned mainly due to low logistics rationalization. The organic retail-wholesale sector is particularly affected by logistics problems (low-volume delivery, and numerous delivery points). This study evaluates collaboration as a tool for logistic rationalization in order to facilitate the process of sustainably localizing the organic food system in the retail-wholesale sector. Performances of current organic farmers' logistics organization regarding their retail-wholesale outlet are evaluated through indicator calculations. Logistics collaboration interests and obstacles are identified through a qualitative analysis. Finally, forms of logistics collaboration are highlighted. This study shows that the impact of increasing logistics efficiency varies greatly depending on the products. Increasing time availability, accessing new markets and reducing logistics costs are the main incentives for logistics collaboration, but obstacles, mainly the singularity of each system, and lack of confidence between partners make collaboration difficult. It is important to focus attention on making improvements at the farm level and the food system level to bring awareness to the challenges and initiate action for sustainable beneficial change.

Key words

Local Food System (LFS), organic farming, logistics, collaboration, retail-wholesale sector

Résumé

La relocalisation de la filière bio apparaît aujourd'hui comme élément primordial au maintien de son développement au sein des territoires. Les circuits alimentaires de proximité (CAP) sont souvent associés à une multitude d'atouts mais des questionnements apparaissent sur leurs performances économiques, écologiques et sociales, due notamment à une faible rationalisation logistique. Le secteur du demi gros est particulièrement affecté par la problématique logistique (livraison de faible volume sur de nombreux points de livraison). Cette étude évalue la collaboration comme outil de rationalisation logistique dans une optique de relocalisation durable des filières alimentaires bio dans le secteur demi-gros. Les performances de l'organisation logistique des agriculteurs bio pour leur débouché demi-gros sont évaluées par le calcul d'indicateurs. Les freins et les leviers à la collaboration logistique sont identifiés par le biais d'une analyse qualitative. Cette étude montre que l'impact d'une optimisation logistique varie grandement en fonction de la nature de la production. La libération de temps, l'ouverture de nouveaux débouchés et la réduction des coûts logistiques sont les intérêts majeurs identifiés à la collaboration logistique. Cependant, des freins, comme la singularité des chaque système ou le manque de confiance entre partenaire rendent leur mise en place difficile. Il est important de travailler à l'échelle des producteurs mais aussi de la filière pour aider à la prise de conscience sur la problématique et initier l'action pour la mise en place de changement durable.

Mots clés

Circuits alimentaires de proximité (CAP), agriculture bio, logistique, collaboration, secteur demi-gros

Abbreviations, acronyms

ANDA: National Organization for Agricultural Development

LFS: Local Food System

CASDAR: Special Account for the Agricultural and rural Development

CEB: Organic and Ecological Center

CHR: Café, Hotel, Restaurant

CSA: Community Supported Agriculture

EU: European Union

FAO: Food and Agriculture Organization

FNAB: National Federation of Organic Farming

GABNOR: Organic Farmers Organization in Nord-Pas de Calais

GHG: Green House Gazes

IFEN: French Institute of Environment

IFOAM: International Federation of Organic Agriculture Movement

IFSTTAR: French Institute of the Transportation, Planning and Network Sciences and Technology

INSEE: National Institute for Statistics and Economical Studies

IUT: University Institute for Technology

NRC: Non Residential Catering

GMOs: Genetically Modified Organisms

SCIC: Cooperative Society of Collective Interest

SSC: Short Supply Chain

SWOT: Strengths, Weaknesses, Opportunities, Threats

VAT: Value Added Taxes

Lists of tables

Lists of figures

INTRODUCTION

The famine affecting Europe after the Second World War placed productivity at the center of farming and encouraged mechanization, industrialization and specialization of farms as well as an industrialization of the processing sector. This is known as the green revolution (Lampkin 2003). Quickly after, negative impacts appeared : Environmental impacts (pollution, erosion, etc.) as well as social impacts such as isolation of farmers and a decreasing number of farmers in the countryside (IFOAM 2010). As consequences to these problems, especially environmental, the organic farming movement emerged in the 1980s, advocating agriculture which led to healthy products and the development of ecologically and socially balanced farming systems (preserving soil and water quality, reconnecting with the consumers for example) (Allard & Henning 2000). Organic farming gained popularity after numerous food crises (bovine spongiform encephalopathy known as mad cow disease or dioxin mainly) and the introduction of controversial new technologies such as genetically modified organism (GMOs). The circle of organic farmers which had been restricted, became bigger, creating major changes in the organic farming sector (Allard & Henning 2000).

Increasing competition appeared, due to the growing amount of organic product volumes on the market as well as the multiplication of downstream players (processers and distributers for example) (Allard & Henning 2000). These new players often viewed the sector differently from the initial values previously mentioned. For most of them, economic rationalization was considered most important and tended to overshadow the social and environmental performances. The change of scale in organic agriculture and preserving its founding principles, especially socially and ecologically, can become a challenge in a world where competitiveness and economic calculation are keys (Allard & Henning 2000; Stassart & Jamar 2009).

These transformations are noticeable in the organic product marketing channels. Where previously direct selling and short supply chains prevailed, currently, increasing amounts of agribusiness and supermarkets disrupt the balance of the previous system and the economic and business organization (FNAB 2014). Many of today's major brands have developed a competitive advantage partly thanks to their capacity to organize themselves and adapt to the huge product variety offered by the global food supply chain. Market globalization has led to a phenomenon of production standardization, enabling a major economy of scale and the development of strategies facilitating optimisation of logistics flows (Sanz & Muchnik 2011; Gonçalves 2013). This food system showed its productive

efficiency in a context of abundant oil resources. However more recently negative consequences of such a dependency have been highlighted in system aspects such as economic fragility. At the food production level, the switch to standardized and specialized areas of production has brought questions regarding the efficiency and sustainability of the food system (Hendrickson & Hefferman 2002; Rastoin & Ghersi 2010; Souchier 2013).

Many local players are trying to avoid the negative effects of globalization, by developing local development-based strategies (Souchier 2013). Organic farmers were pushed to develop, often collectively, organization at the local level to help them to defend the elemental principles of organic farming through what is called Local Food Systems (LFS). The increased number of local initiatives and their diversification enable new marketing channels for local farmers (FNAB 2014).

LFS are often connected to economic, social and environmental values. However, the performance of LFS has undergone much debate (Gonçalves 2013). Farmers involved in LFS often see their workloads increase and often need to gather more physical material, and financial resources than a farm involved in the classical marketing chain (Capt et al. 2011). Furthermore, some authors conclude that some LFS have lower energy efficiency than long distribution channels and that decreasing the distances is not enough to guarantee a better environmental sustainability (Pirog et al. 2001; Schlich & Fleissner 2005; Edward-Jonhs et al. 2008). In LFS, volumes being transported do not always enable a high loading capacity. Transport is often done in small quantities with an optimization level especially low at the beginning and the end of the delivery route, with a lot of empty return. One of the main criticisms against the classical form of LFS (direct selling, farmers market or CSA), is the lack of optimization in the supply chain (Commissariat général au développement durable 2013; Perez-Zapico 2008).

Even though logistics is a key element in setting up a LFS, the 'logistics' part is often discredited by farmers because they think they do not have enough time, skills or money to make it evolve (Messmer 2013). Some farmers even reject the LFS because they perceive this lack of logistic optimization as an obstacle they consider time-consuming and unprofessional. Because of a lack of information, skills and connection to the right networks, some farmers do not have the opportunity to develop more organized systems or do not manage to make them economically or socially sustainable (Aubry et al. 2011).

However, even if individual strategies are the most developed, projects of a new kind are appearing to overcome these logistic obstacles. These projects innovate in order to increase collaboration to optimize logistics on both vertical and horizontal levels. Vertical collaboration corresponds to contact between various types of stakeholders (farmers,

middlemen, consumers etc.), and horizontal collaboration refers cooperation between actors of the same category, between farmers or between distributors for instance (Messmer 2013; Gonçalves 2013). Nevertheless, they are not always easy to implement in an environment of competitive logic for production. Development of tools to accompany and strengthen these collaborations therefore seems essential (Gonçalves 2013).

Although there is room for improvement in logistics for all the marketing channels, exploratory interviews with experts highlighted the fact that logistic rationalization is essential to the development of the retail-wholesale sector distribution to make it more sustainable. The retail wholesale sector is particularly affected by the logistic problems because it concerns the delivery of a relatively low-volume of diverse products at numerous delivery points and for a sales price close to the wholesale price.

Taking this framework into account, this study aims to evaluate to what extent collaboration can be seen as a tool for logistic rationalization for farmers in order to facilitate the process of sustainably localizing the organic food system in the retail-wholesale sector.

To help address this topic the following research questions will be explored:

- What are the economic, ecological and social performances of the current organic farmers' logistics organization regarding their retail-wholesale outlet?
- What is inhibiting or supporting logistic collaboration among the organic farmers involved in the local food system (LFS) (horizontal collaboration)?
- What is inhibiting or supporting logistic collaboration between organic farmers and other stakeholders involved in LFS (vertical collaboration)?

To address these questions a case study area has been chosen in Nord Pas de Calais region, in the North of France. This region is a very dense region with a population of 324 inhabitants per square kilometers (inhab./km²) when France have an average population of 113 inhab./km² (INSEE Nord Pas de Calais 2009). However farming is important as well, as it takes up 66% of the land. This situation is favorable to upkeep the traditional direct selling, on farms or at farmers markets, even though marketing channels are diversified (Agreste 2011). This graph illustrates the predominance of the retail outlets in the region (cf. figure 1). However 16% of the farmers selling their products locally have at least one retail-wholesale selling point and 7% are involved with supermarkets. Even though it is not the majority, the development of these new outlets is important in a perspective of opening and accessing new marketing channels for the increasing number of organic farmers and organic products volume on the local market (Agreste 2011).

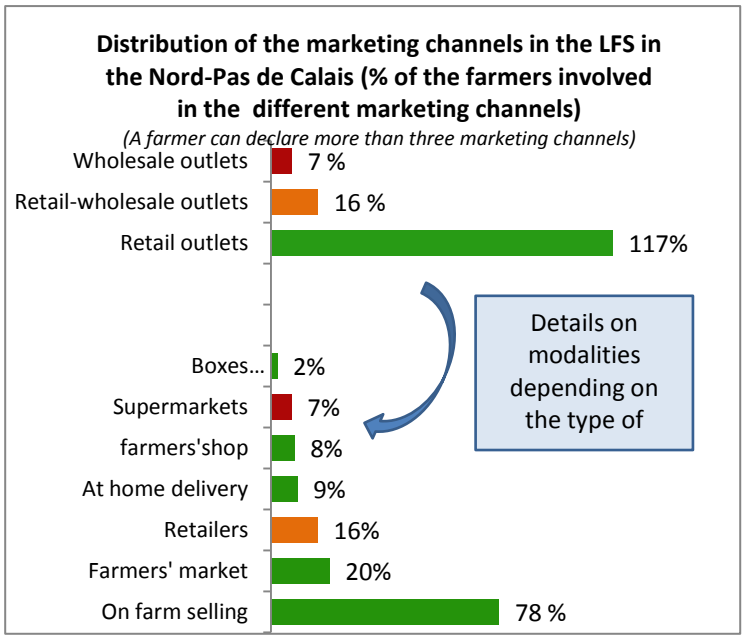


Figure 1: Distribution of the marketing channels in the LFS in the Nord-Pas de Calais (% of the farmers involved in the different marketing channels)

Source: Adapted from Agreste, 2011

Concerning organic farming, in 2012, three French regions had less than 1% of the available farming land grown organically. Nord-Pas de Calais region, with 0.9% of its farming land grown organically is part of those three regions when the average in France is 3.8%. The 286 organic farms of the region farm make up an area of 7,774 ha. This positions the region at the 22^{d} rank for the percentage of farming land grown organically, the second to last in France. However, with 511 downstream actors (distributors and processor), is positioned in the 9th rank in France (of 24). It is interesting to notice the important number of downstream actors in the organic sector partly due to the potential existing in the neighboring countries such as Belgium or Germany which have a significant part of their land grown organically relatively speaking, with 4.4% and 6.2% respectively (Agence Bio 2013).

Even though Nord-Pas de Calais is not the region where the most organic farms are in France, in the past few years a growing reflection on their marketing strategies and logistics appeared among organic farmers in the region. During exchanges between organic farmers, organized by the regional organic farmers' organization, the Gabnor, they started sharing their concerns about the efficiency of their logistics, the time they were spending on deliveries, the economic impact of their marketing strategies as they often have many selling points that they deliver individually. Some mentioned the interest they could have to collaborate more, but obstacles quickly appeared preventing collaboration. This study also aims to bring these farmers some more elements and materials to help them move from ideas and statements toward action.

This paper is articulated in four sections. The first section explains in detail the integrationof the work conducted within a general frame describing the problematic area in the food system context. It shows the relevance of the problem studied and how the specific research questions arose. The second section explains step by step the methodology used to answer the research questions. The third section presents the results and discusses how they are placed within the scope of reference of the initial aims. The fourth and last section is a discussion/conclusion discussing the implication of the results in the studied area and gives suggestions and propositions to move toward action. This section finishes with limitations of the study and suggestions for further research.

PART 1: CONTEXT

This first section aims to explain the integration of the work conducted within a general frame and show its relevance within the food system context. It introduce the reasons that leaded to the objectives and research questions.

1. Organic farming, change of scale and transformation: Exploring innovative methods of organization.

This section explains the recent evolution in organic farming that leaded to changes of scale impacting the entire sector. The first part of this section will present organic farming and its recent evolution, the second part gives an overview of the current organic sector and the last one clarify the concept of 'conventionalization' of organic farming and how it impacted the organic Food System.

1.1. Organic farming: evolution and changes in scale

Definitions of organic agriculture are numerous but this research will reference the commonly cited FAO definition, "*A holistic production management system that avoids the use of synthetic fertilizers and pesticides, and genetically modified organisms, minimizes pollution of air, soil and water, and optimizes the health and productivity of plants, animals and people*" (FAO 2007).

Organic farming has always existed along with farming. However, the first organic farmers who called themselves that way were looking for a healthy product and the development of an ecological and social balanced system on their farm (preserving soil and water quality, reconnecting with the consumers, etc.). Their farms, often small sized and family based, were relying on an approach of self-sustainability close to the European farms' model of the 1950s (small family farms with a diversified production) (Allard & Henning 2000).

The famine affecting Europe after the Second World War changed this tradition and placed productivity in the center of farming. This encouraged mechanization, industrialization and specialization of farms as well as an industrialization of the processing sector. This is known as the green revolution. Quickly after, negative impacts appeared : Environmental impacts (pollution, erosion, etc.) as well as social impacts such as isolation of farmers and a decreasing number of farmers in the countryside (Lampkin 2003; IFOAM 2010).

As consequences to these problems, especially environmental, a rebirth of the organic farming movement emerged in the 1980s. The organic farming gained popularity after

numerous food crises (mad cow disease (bovine spongiform encephalopathy) or dioxin mainly) and the introduction of controversial new technologies such as genetically modified organism (GMOs). The hitherto restricted circle of organic products got bigger, creating major changes in the organic farming sector. This evolution will be developed further down in the paper (cf. section 1.3 of part 1) (Allard & Henning 2000).

1.2. Organic farming summarized in some numbers

At the end of 2011, data from the IFOAM (International Federation of Organic Agriculture Movement) estimated organic agriculture covered 37.2 million of hectares of the world's landmass (certified or in conversion). This represents 0.9% of the agricultural land worldwide in the 162 countries observed (Agence Bio 2013). In 11 years, between 2000 and 2011, the surface cultivated with organic farming practices has increased by 2.4 times, and the number of farms increased by 7.2 times (Agence Bio 2013). In 2012, the European Union (EU), had 9.7 million hectares of land grown using organic agricultural methods. This is 2.6% more than in 2011 and represents 5.4% of the agricultural land (Agence Bio 2013).

In France in 2007, 2% of the national agricultural land was dedicated to organic farming. This quickly rose to 3.8% in 2012, reflecting the relatively important transition movement over the past years. 4.7% of French farms are growing organic, putting France in the 30th position worldwide in terms of farming land dedicated to organic agriculture, and 17th position within the EU (Agence Bio 2013).

The distribution networks[1] vary in diversity and structure depending on the country. In France, they are diverse but dominated by food supermarkets and specialized organic shops (cf. figure 2).

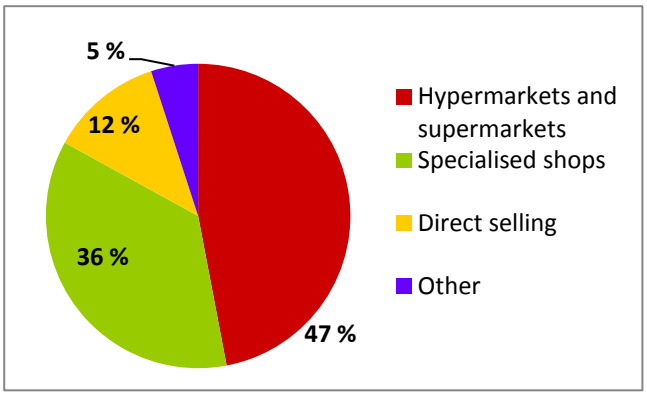


Figure 2: Percentage of organic product sales in France according to distribution networks

Source: Adapted from Agence Bio, 2013

Worldwide consumption is becoming more important every year. In 2011, the market was estimated at 20.4 billion euro VAT (Value Added Taxes) mostly situated in Germany, France, Italy and the United Kingdom. In France, with a turnover of 4 billion euro including VAT in

[1] See glossary

2012, consumption of organic products has been estimated at 2.4% of the total food market when this was only 1.3% in 2007 (Agence Bio 2013). This increase in consumption explains the diversification of distribution networks, especially with the arrival of large retailers as more players got interested in this market.

The organic agriculture sector is undergoing constant evolution in both production and distribution sectors. Regarding production, organic crop and pasture lands are increasing while distribution networks are diversifying. These changes are intended to meet the growing demand for organic products from consumers.

1.3. 'Conventionalization' of organic farming and the search for organizational innovations

The rapid growth of the organic sector has led to change within organic farming methods. There is increasing competition due to the growing amount of organic farmers and available product volumes on the market as well as the multiplication of downstream players (processers, distributers etc.). Many new players in the public and private sector (territorial collectives, institutional organization for example) are becoming involved in the organization of the organic sector (Allard & Henning 2000).

These new players often view the sector differently from the initial values described in section 1.1. Economic rationalization is often considered more important and tends to overshadow the social and environmental performances. More and more debates exist around the development of organic farming and its future evolution. The change of scale in organic agriculture and preserving its founding principles, especially social and ecological, can become a challenge in a world where competitiveness and economic calculation are keys. The risk of degrading the elemental principles increases. Some researchers use the term 'conventionalization' to describe the progressive evolution of practices which tend to push organic farming requirements to its limits. This results in a softening of standards which potentially threatens the integrity of the organic system (shorter crop rotations, loss of the respect for preventive approach for animal health or not following pasture obligations for instance) (Allard & Henning 2000; Stassart & Jamar 2009).

These transformations are noticeable in the organic product marketing channels. Previously direct selling and short supply chains prevailed, while currently increasing amounts of agribusiness and supermarkets chains disrupt the balance and the economic and business organization. Even if, these new players open the market and increase demand, it also leads to a stronger pressure on prices for farmers. This pressure has lead

to changes in farming practices in order to cut down on production costs (farms specialization for instance). These changes often decreases the systems' sustainability (FNAB 2014).

These transformations pushed some organic farmers to develop, often collectively, innovative forms of organization enabling them to defend the elemental principles of organic farming. The development of these initiatives at the local level are important to secure these principles (FNAB 2014).

2. Localizing the food sector to organize and support the organic agriculture's change of scale.

This section explains this concept of localized food system that appears to be a solution to support the organic agriculture's change of scale. The terminology around local food system and short supply chain will be clarified before highlighting how local products became a new trend of consumption.

2.1. Short food supply chains or local food systems; trendy terms but remains unclear

In the food sector, the question of short supply chains is central nowadays but its definition is not well defined. The difference between short food supply chains and local food systems remains unclear and refers to very different types of organizations (Gonçalves 2013).

A first definition of short food supply chains has been given by former French Minister of Farming and Fishing , Michel Barnier in 2009 as, "*A way of commercializing food products either by direct selling from producers to consumers, or by indirect selling, as long as there is only one middleman*" (Brudey & Ducrocq 2000).

This definition is very unclear as it does not take into account the notion of geographic distance nor the middlemen's characteristics (cooperatives, distributors or wholesalers for example). Some see short supply chains (SSCs) with a concept of geographic proximity and "local", through administrative delimitation (country, county, municipality etc.), or through an amount of kilometers (50 kilometers around the farm, 100, 150…). Others will see SSC as a degree of commitment between the stakeholders participating in the exchange, such as the CSA (Community Supported Agriculture) system. In CSAs, the consumer commits financially through a payment in advance, sharing the farmer's risks and socially by participating in some production activities (Herault-Fournier 2010).

However, despite this plurality of definition, the concept of SSCs , in public debates and academic works, always refers to distribution channels being in a geographic and interpersonal space which is more restricted than the classical model (Gonçalves 2013).

Despite the variety of definitions used to describe SSCs, the following definition will be used throughout this study to describe Local Food Systems (LFS): *a processing or marketing channel of food products, alternative to the dominant system, and characterized by proximity between players of the food chain: producers, processors, distributers and consumers*. The concept of proximity does not only refer to the geographic proximity but to its three additional dimensions, identity proximity (sharing the same values), interpersonal proximity (enabling exchanges) and process proximity (idea of transparency) (Herault-Fournier 2010).

2.2. Local: A new trend of consumption

The local food systems (LFS) topic emerged some years ago in the public debate as well as in scientific research. At a global level, the interpersonal proximity is getting wider and more complex. Many of today's major brands have developed a competitive advantage partly thanks to their capacity to organize themselves and adapt to the huge product variety offered by the global supply chain. The dispersal and specialization of production places and their disassociation with the pool of consumers explain this fact. Market globalization has led to a phenomenon of production standardization, enabling a major economy of scale and the development of strategies facilitating optimisation of logistic flows. Farmers started to produce 'commodities' rather than food and little by little lost their place in the bargaining sector of the current food supply chain. In particular, this was caused by by the "price leadership" competitive strategy of multinational distributors and agribusineses (Sanz & Muchnik 2011; Gonçalves 2013).

This food system showed its productive efficiency in a context of abundant oil resources. However more recently negative consequences of such a dependency have been highlighted in system's aspects such as economic fragility. At the food production level, the switch to standardized and specialized areas of production has brought questions regarding the efficiency of the food system. These topics include affects concerning production areas such as loss of local biodiversity, loss of governance from the farmers, loss of system sustainability, negative impacts on the environment, health, or even on the local economy. Despite a 'predominance' of the production and consumption model, different types of alternative strategies are growing. Local players are trying to avoid the negative effects by developing local development-based strategies (Hendrickson & Hefferman 2002; Rastoin & Ghersi 2010; Souchier 2013).

For some years now, the public interest for local production has increased. In 2010, 21% or approximately 1 in 5 French farmers sold at least a part of their products in a geographic restricted area (Agreste 2012). The concept of proximity is becoming a key value in the food system (Etude Xerfi 2012a). Development of LFS highly is supported by local businesses. For example, McDonald's is putting 'local' offers on the menu such as 'Charolais' [beef breed], the institutional catering companies, in particular SOGERES (SODEXO chain) are starting local supply politics (Etude Xerfi 2012b). Supermarkets in France such as Système U, E. Leclercq shops or even the Auchan chain, develop more and more direct partnership with local farmers. The Biocoop network, the main specialized chain in organic products in France, also has a strategy for encouraging localized supply. Offers for local products increase and the diversity of actors involved in this new food model increase.

As explained throughout this section, LFS have increased in response to the limitations of the dominant global system and has a growing interest of local players. The increased number of local initiatives and their diversification enable new marketing channels for local farmers, particularly those in the organic sector.

3. Limits of a local food system: From viable to sustainable

Local Food Systems (LFS) are often connected to economic, social and environmental values as discussed in the previous section. However, the importance of these elements in relation to the performance of LFS has undergone much debate (Gonçalves 2013).

3.1. Economic and social performances

LFS's economic performances are poorly known and still forming. One of the reasons for this is the disparity of economic performance of the farms. However, it seems incontestable that the farms involved in LFS create more jobs than those without local activity (Capt et al. 2011; Souchier 2013). This is partly due to the fact that these systems are often more labor intensive (Herault-Fournier 2010; Capt et al. 2011),

In France, LFS represent three quarters of the revenue for four out of ten farmers (except wine-growers) (Agreste 2012). However, LFS seem to increase the need for labor to guarantee production and distribution. Farmers often see their workloads increase and often need to gather more physical material, and financial resources than a farm involved in the classical marketing chain. This increase of workload is not always connected to an adequate economic profit and asks the question of how 'livable' is the marketing system chosen in the construction of LFS (Capt et al. 2011).

Regarding social matters, LFS are often associated with the idea of direct links between farmers and consumers and the strengthening of the concept of solidarity between farmers and consumers but also between farmers themselves. But here disparities also exist. The diversity of farmers committed to LFS makes the collective organization difficult sometimes. Many are not willing to put a lot of time or money into a collective form to develop their activity. This make some of them excluded from the farmer cooperation networks (Gonçalves 2013).

However, more and more collective initiatives are being supported by local authorities, and even if farmers don't get involved in a cooperative ways of selling their products, awareness is growing on the importance of organizing the supply chain locally (Chiffoleau 2012).

3.2. Environmental performances: Logistics as a key element for localizing the food system.

Food products have an environmental impact for their entire life cycle: on resources (water, soil, air, etc.), health (human toxicity, eco-toxicity), biodiversity and climate change (Commissariat général au développement durable 2013). The environmental performance of food chains relies on multiple parameters. Therefore, in France, where 57 % of greenhouse gases (GHG) come from the production sector of the food chain (IFEN 2006), the environmental impact is not only limited to the production methods but also to processing and distribution (supply, storage, logistic) (Berger 2013).

Combinations between LFS and virtuous environmental practices are often made, but they need to be nuanced. Indeed, LFS are not connected to specific environmental requirements and do not always correspond to beneficial practices for the environment (IFOAM 2010). However, it is important to remember the high portion of organic farmers involved in LFS. In France organic farmers represent 10% of the those involved in LFS but this is only represent 2% of French farmers overall (Agreste 2012). To best visualize this, a systemic and multi-criteria approach can show the contributions of organic farming to limit the environmental impact of farming: water protection, health preservation, support of biodiversity, fight against global warming through practices that limit the carbon impact (no fertilizers or chemicals etc.). These are some of the ecosystem services provided by organic farming (GABNOR 2011; IFOAM 2010).

A lot of scientific research and discussion exist today around the environmental impact of the distribution systems in LFS, especially linked to the relation made between decreasing energy consumption and GHG emissions. Some authors conclude that some LFS have

lower energy efficiency than long distribution channels. They show that local food systems are not often the most efficient logistically speaking, especially when linked to a low optimization. Decreasing the distances is not enough to guarantee a better environmental sustainability (Pirog et al. 2001; Schlich & Fleissner 2005; Edward-Jonhs et al. 2008).

In short supply chains, volumes being transported don't always enable a high loading capacity. Transport is often done for small quantities with an optimization level especially sensitive at the beginning and the end of the journey with a lot of empty return. Moreover, the increasing number of refrigerated rooms on farms and travels of consumers can ask the question of energy efficiency (Commissariat général au développement durable 2013; Redlingshofer 2008; Perez-Zapico 2008).

Questioning the economic, ecological and social performances must not become an obstacle to localizing the food system. On the contrary, these reflections need to push to rethink the local organization of supply in order to optimize its logistics, to improve its environmental efficiency and optimize its economic and social performances. Decreasing costs linked to a logistic rationalization could enable a better accessibility for organic products for a wider number of consumers.

4. Logistics: collaboration as a tool for optimization

The previous section highlighted the debate existing around LFS' social, economic and ecological performances. This new section first explains why logistics has an important role to play in this debate as the low performances of LFS are mostly link to a low logistics rationalization. It also presents collaboration as a potential tool for logistics rationalization and shows in what way the logistics problematic is important for the retail-wholesale sector.

4.1. Why discuss logistics?

The previous sections explained the importance of environmental impact and logistics organization within the theme of localizing the food system. The 'logistics' part is often discredited by farmers because they think they do not have enough time, skills or money to make it evolve. However, logistics are a key element in setting up a LFS (Messmer 2013).

The food 'supply chain' is composed of three main components, producing, processing and transporting. The logistics step includes planning, preparing the order and delivering the products. One of the main criticisms against the classical form of LFS (direct selling,

farmers market, CSA), is the lack of optimization in the supply chain. Some farmers even reject the LFS because they perceive this lack of logistic optimization as an obstacle they consider time-consuming and unprofessional. Because of a lack of information, skills and connection to the right networks, some farmers do not have the opportunity to develop more organized systems or do not manage to make them economically or socially sustainable (Aubry et al. 2011).

Projects of a new kind are appearing to overcome these logistic obstacles. These projects innovate in order to increase collaboration and cooperation to optimize logistics on both vertical and horizontal levels. Vertical collaboration corresponds to contact between various type of stakeholders (farmers, middlemen, consumers etc.), and horizontal collaboration refers cooperation between players of the same category (between farmers, between distributers, etc.) (Messmer 2013; Gonçalves 2013).

4.2. Logistics: Definition and functions

Logistics is defined as the "function organizing the matter channels, the art of delivering, at the lowest cost, the right product at the right place and at the right time" (Sohier & Sohier 2013). This includes elements necessary for product distribution from the producer to the consumer such as transportation, logistic services (packaging, storage, etc.) and information flows management.

Logistics exist to organize material flows and is composed by three types of operations:

- Planning operations: Order forecast, scheduling supply and flows management.

- Administrative operations: processing and monitoring the orders and physical flows and stock running.

- Physical operations: Preparing orders, handling, transporting and storing goods (Sohier & Sohier 2013).

As part of food production, and more precisely marketing of the agri-products, logistic steps could be resumed as shown in the following illustration (cf. figure 3):

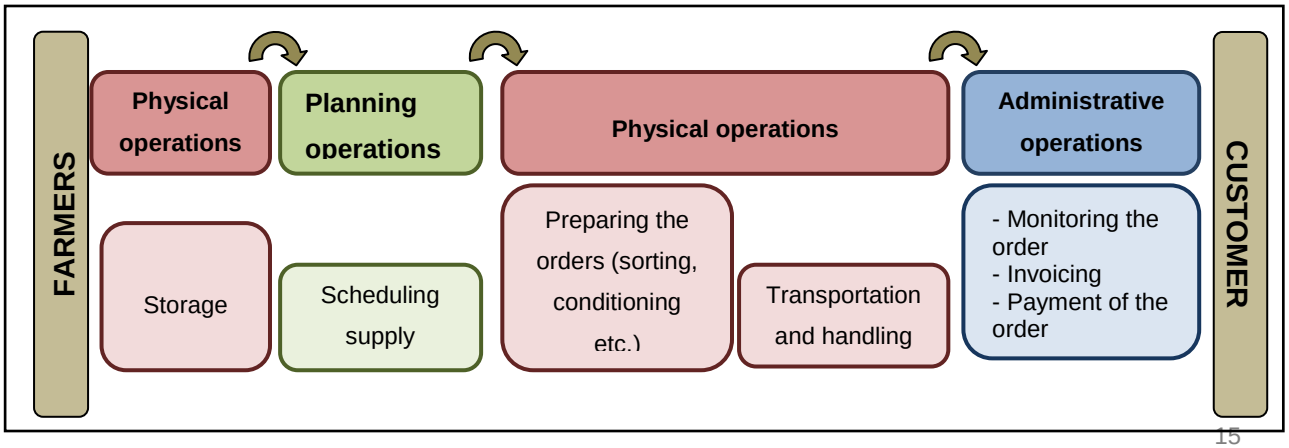


Figure 3: Logistics steps of the food products marketing channel for the farmers

Source: Auteur, 2014

4.3. The general evolution of logistic strategies

The majority of consumers make their purchasing in shops owned by bigger companies. Belonging to these companies enables shops to take advantage of communication operations and collective purchases, but also to become part of a common logistic network for product distribution. These logistic organizations enable business management from production and storage to the shops. Distribution operations are getting more complex and logistics take a central place in this scheme (Orsini 2008).

Understanding the evolution of logistic strategies used in different sectors is interesting. It acts as a base of reflection for the development of a local, collaborative distribution systems method of localizing the food system.

This section explains the recent evolution of logistics through three diagrams (figure references, 4, 5 and 6). It is important to recall that these logistic strategies are the results of an adaptation to production strategies based on specialization of production units and delocalization of supply and production. The evolution of the distribution model goes from a simple organization connecting the producer to its point of sale directly to more complex organization forms in which a number of transfer points are added. The illustrations are simplified representations of the different schemes that have been developed. However, it is enough to understand the general evolution that happed in a majority of sectors and understand the mechanism of it. It becomes then possible to take inspiration from elements that can be applied to the development of a sustainable LFS.

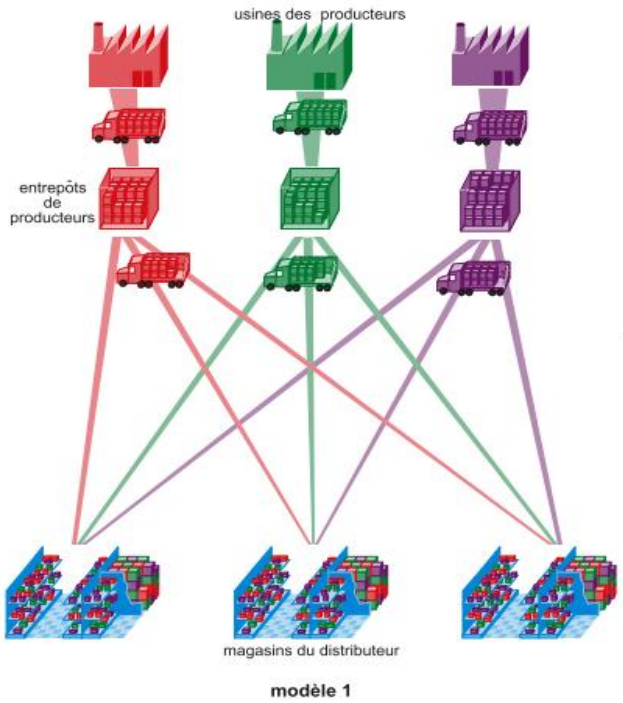


Figure 4: Model 1: Direct supply from the producers

Source: Orsini, 2011

4.3.1. Model 1: Direct supply from the producers

Originally, the shops' supply was mainly delivered by producers who dispatched their products directly from their company or warehouse to the shops as illustrated in figure 4. Each shop had enough space to manage the safety

stock[2]. Having security stock allowed a low delivery frequency which was necessary to enable the producer to optimize truck storage capacity to reduce transportation costs. Most of the time sales contracts included delivery service to the shops (Orsini 2008).

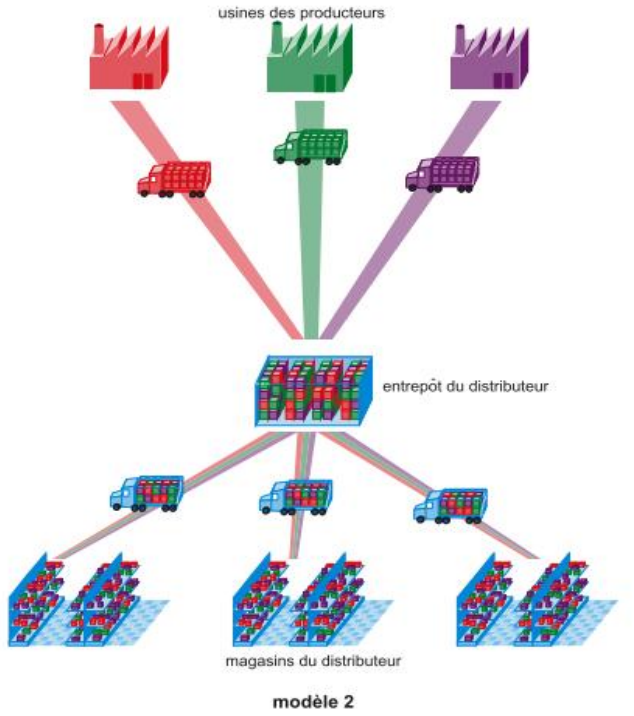


Figure 5: Model 2: Supply through platforms
Source: Orsini, 2011

4.3.2. Model 2 : Supply through platforms

Passing through platforms, transit points where goods are held to be transferred to the point of delivery leaded to the rationalization the whole transportation chain and reduced the price of transportation as illustrated in the figure 5. Previously, producers did not charter trucks transporting only a few products. Now they have regional warehouses which acts as a storage unit allowing trucks to gather and be filled to optimum capacity with numerous types of products to be delivered to the necessary shops

Downstream of those warehouses, deliveries are made from the platform with filled trucks transporting goods from various producers. This technique is called ‘downstream pooling’ (Sohier & Sohier 2013; Orsini 2008).

This model transfers the security stock from the shops to the “distributor warehouse”, where goods are pooled for all the shops served by a specific warehouse. Meanwhile, storage space in shops have been converted into selling areas, reducing storage costs (Sohier & Sohier 2013; Orsini 2008).

[2] Safety stock is the stock evaluated as necessary to insure the wanted service level when the orders to deliver overtake the production capacity.

4.3.3. Model 3: Toward collaborative practices and logistic pooling

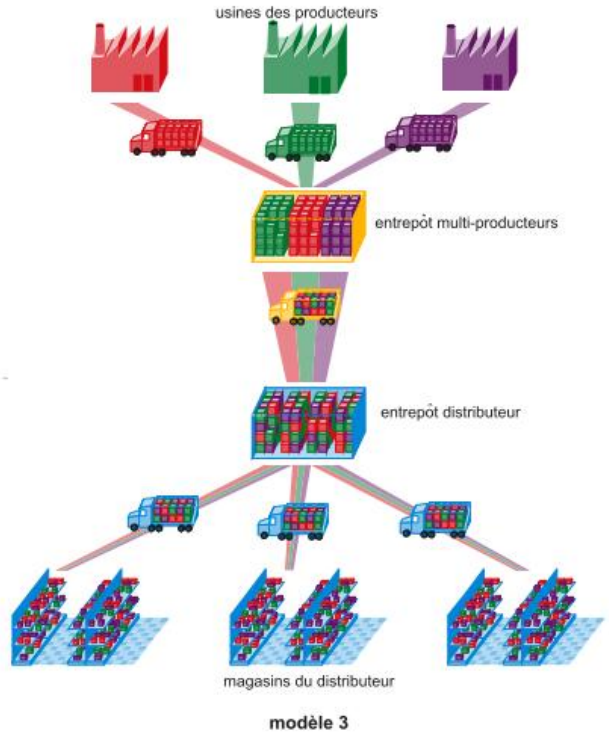


Figure 6: Model 3: Toward collaborative practices and logistics pooling

Source: Orsini, 2011

In the third model (cf. figure 6), several producers gather their flows at a multi-producer warehouse before sending the goods to the distributer. The reason for this is because individually, producers do not have the necessary volume to supply all the regional warehouses from one distributor with the wanted frequency. This is called "upstream pooling"(Orsini 2008). In this case, producers and platforms are situated in the same logistic region and pool the upstream transportation. They do this by looking for triangulation to reduce the empty journey and improve the loading capacity rate of the vehicles.

This innovative method of organization creates a scheme in which the producer is even more disconnected from the final client and questions elements such as the distribution of logistic costs or information flows management (Orsini 2008).

Even though this chart is simplified regarding the diversity within the existing organization system, it illustrates the growing coopétition (cooperation and competition) between players of the large scale distribution, upstream or downstream, to optimize logistic, optimize the delivery routes or the use of information technology. The development of such collaborations have to be built in time and go through a process of commitment and acceptation of the information pooling, especially business information (Barratt 2004). This model evolution is no exception in the LFS framework where similar logistic rationalizations are problematic.

4.4. Collaboration as a key element for LFS logistic rationalization?

Messmer (2013) identified collaboration between players as a key factor to successful LFS. He identified the expressions of these collaborations through three main factors.

- 'Coopetion' which he defines as an o*pportunistic collaboration between various economic players*" (p.36)
- 'Pooling' which is connected to a *"Gathering of means and "savoir faire" in order to save more time and money*" (p.36)
- Association between multiple projects or operating in networks. He identified trust and coordination between the group members as a fundamental condition to its success (Messmer 2013).

In practice, these collaborations can take various forms, such as development of a network of delivery places (shops, train stations, companies etc.) to deliver/sell products, or the pooling of well localized spaces in the logistic chain. These collaborations can also be the pooling the labor force, or means of transportation, or compiling LFS projects or utilizing networks which share the same values.

LFS are evolving today due to the increasing diversity of marketing channels but also from the development of new ways of collaborating and organizing (Berger 2013). The different diagrams about the evolution of logistic strategies seen in the previous section (cf. section 4.4), can be drawn closer to the evolution of LFS. Direct selling are following the first model when indirect local selling which emerged in order to optimize logistics through collaboration follow either the second or third model with more and more innovative systems based on collaboration.

Therefore, as is the same in more classical distribution channels, in LFS decreased space does not suppress the logistic needs. However, it is individual strategies which are being developed even if they have limited linkages to logistic rationalization. Strategies oriented toward vertical and horizontal collaboration are more and more recommended. Nevertheless, they are not always easy to implement in an environment of competitive logic for production. Development of tools to accompany and strengthen these collaborations therefore seems essential (Gonçalves 2013).

4.5. The challenge of logistic rationalization in building a sustainable, organic, local food system for the retail-wholesale sector

During preliminary research for this study, expert exploratory interviews put into light the importance of logistics within retail-wholesale channels (cf. definition after the table 1) such as specialized shops, or Non Residential Catering (NRC).The results of these interviews are summarized in the table 1 below (cf. table 1).

Table 1 : Difference of impacts for an efficient logistics depending on the marketing channel

Source: Author, 2014

		Delivered volume per delivery point	Delivered products variety	Selling price (Compared to average price)	Necessity for a rationalized logistic
Direct selling	CSA	Low	High	High	Medium
	Farmers' market				
	Farm shop				
Indirect selling Retail-wholesale market	NRC (non residential catering)	Low	High	Low	High
	Specialized shops				
	Other shops				
Indirect selling Wholesale market	Wholesalers	High	Low	Low	Relatively low
	Central purchasing				

Although there is room for improvement, in all the different outlets, stakes of this logistic improvement differ. The retail wholesale sector is particularly affected by the logistic problems because it concerns a relatively low-volume of diverse products at numerous delivery points and for a sales price close to the wholesale price (cf. table 1).

Challenges of a logistic optimization in the retail-wholesale distribution channel appear all the more so as in a perspective of making this outlet durable and also diversify the local organic outlets.

DEFINITION OF THE RETAIL-WHOLESALE USED IN THIS STUDY:

- Small volumes of multiple products ordered to various delivery points.
- A purchase price close to that of the wholesale market
- A high level of service (including delivery)

5. Research questions

Localizing the organic food system appears as a key element for sustaining the local development of organic agriculture. LFS are often attributed to various advantages but, more and more food system players, supported by the academic world, questioned LFS economic, ecological and social performances, mainly due to the low logistic rationalization. This question around logistic rationalization has been identified as essential to the development of the retail-wholesale sector distribution to make it more sustainable. Logistic collaboration has been identified as a key element for the logistic optimization in the LFS. Numerous innovative projects are developing around these collaborations. It seems important to better understand the dynamic around these collaborations to better accompany or reinforce them as well as support the development of existing tools.

The objective of this study is the following:

Collaboration as a tool for logistic rationalization for farmers in order to facilitate the process of sustainably localizing the organic food system in the retail-wholesale sector

To help address this topic the following research questions will be explored:

- What are the economic, ecological and social performances of the current organic farmers' logistics organization regarding their retail-wholesale outlet?

- What is inhibiting or supporting logistic collaboration among the organic farmers involved in the local food system (LFS) (horizontal collaboration)?

- What is inhibiting or supporting logistic collaboration between organic farmers and other stakeholders involved in LFS (vertical collaboration)?

PART 2: MATERIALS AND METHODS

In order to answer the research questions, a methodology has been set up and has been refined throughout the research. This chapter explains the chosen methodology and details step by step the process of it. First the exploratory phase is explained, and then the methodology developed to evaluate the farmers' logistics performances is described followed by the methodology to identify the inhibiting and supporting factor of logistics collaboration. The final part explains the methods used to help moving toward action helping to move from the current situation as identified, to a potential wanted situation.

1. Exploratory phase

Before data collection begins, it is important to understand the context in which the research is done in order to check the validity of the topic addressed and refine the research questions (Quivy & Van Campenhoudt 1995). This exploratory phase has been elemental to this research. It is composed of a reading phase and exploratory interviews. The reading phase intends to test the quality of the research subjects, while the interviews compare the theoretical background found through the literature review with the reality of the field identified by key actors.

1.1. Literature review

Every research project is part of a bigger picture. It is important to get as much information as possible on what is already known about the topic of interest. A reading phase is necessary to situate the research in relation to other recognized scientific works to gain a certain 'external validity' (Quivy & Van Campenhoudt 1995).

Scientific articles, books, theses or grey papers has been chosen and read in such a way that it is as representative as possible on what has been published on the subject. They have been chosen so that diversified approaches are presented and different viewpoints explored.

In this way, research has been completed on localizing the economy and the food system, short supply chains and their limits, logistics and more specifically, the logistics linked to local food systems. The understanding of the collaboration has been deepened. Finally, the role of organic farming within this context has been developed, in order to understand the link between organic farming, local food systems and logistics.

1.2. Exploratory interviews

Once the research topic was clarified, exploratory interviews helped to test the topic's relevance and rectify its frame. The interviews also highlight facets of the research that may have been neglected during the literature review (Quivy & Van Campenhoudt 1995).

Seven expert interviews have been conducted. As evident in the table below (Cf. table 2), the variety of profiles brought expertise on various dimensions of the themes of organic farming and logistics collaboration.

Table 2: Experts interviewed during the exploratory phase of the study

Source: Author, 2014

Affiliation of the interviewee	**Field of Expertise**
Researcher at IFSTTAR (French Institute of the Transportation, Planning and Network Sciences and Technology)	**Short supply chains logistics**
Researcher in the organization "Virage Energie Nord-Pas de Calais"	**Energy transition- Food energy costs**
Researcher/ Professor in logistics management at Lille University	**Transportation and logistics management**
Project manager on the organic sector organization in Gabnor (Nord Pas de Calais organic farmers organization)	**Organization of the organic sector in the region**
FNAB (National Federation of Organic Agriculture)	**Organic sector localization**
"Saveurs et saisons" organic shop manager	**Logistics management**
Project manager of "Livicote" (project of mobility service)	**Transportation and logistics management**

In appendix the detail of the projects and studies each of them carries that are linked with this study (See appendix 1).

These meetings have been led in a semi-structured way. Therefore, a nonbiased position and active listening have been utilized, although when the subject drifted, interviewees were brought back to the topic in question.

These interviews enabled a better grasp of the logistics dimension of the research and highlighted the specificity of the retail-wholesale sector's relationship to logistics (see part 1 section 4.5) and the importance of targeting research on this specific distribution channel as no literature is yet available on the topic.

1.3. Setting up a 'follow-up body'

Some of the expert interviewed during the exploratory interviews showed a high interest for this topic research which lead to the creation of a 'follow-up body' for the study. This follow up body has been gathered on three separate occasions so they could take part in shaping

how the research progressed. They brought their viewpoints, their knowledge and expertise on certain facets of the research. This follow-up body enabled, on the one hand, to approve the evolution of the study, the associated methodology and the accuracy of the analysis made, but also to guarantee the consistency of the research with the needs and expectation of the local actors.

The follow-up body is composed of four members who have expertise in various fields interesting to the progress of the study: An expert in organization of the organic sector in the case study area, an expert in transportation and logistics management, an expert in LFS logistics, and an expert in energy transition and food energy costs (cf. table 2 and appendix 2 for more information on each of them). Each of the four members was also interviewed during preliminary explorations and as mentioned was gathered three times during the study. First at the beginning, to discuss and approve the methodology chosen, then a second time to discuss and approve the choice of indicators and finally near the end, to discuss the first results, the propositions and possible relevant actions regarding those results.

1.4. Research questions

The information gathered during the exploratory phase led to the development of research questions and also a methodology to answer those questions. As a reminder, the objective of this study is the following: *Collaboration as a tool for logistics rationalization for farmers in order to facilitate the process of sustainably localizing the organic food system in the retail-wholesale sector.* To help address this topic the following research questions will be explored:

- What are the economic, ecological and social performances of the current organic farmers' logistics regarding their retail-wholesale outlet?

- What is inhibiting or supporting logistics collaboration among the organic farmers involved in the local food system (LFS) (Horizontal collaboration)?

- What is inhibiting or supporting logistics collaboration between organic farmers and other stakeholders involved in LFS (Vertical collaboration)? (cf. part 1 section 5)

Two main axes to the research appear from those research questions and will structure the research in two parts:

- A first axis is the evaluation of **economic, ecological and social performances** of the **logistics** of the local food system concerning the organic retail-wholesale sector.

- A second axis is the identification of the **supporting and inhibiting factors for logistics collaboration**.

2. Farmers' logistics performance evaluation

2.1. Indicators

In order to evaluate the farmers' logistics performances, it has been chosen to do a quantitative data analysis as the performances evaluation is mainly based on quantitative data of the different farmers. For this quantitative analysis, appropriate indicators have been identified. To ensure that all data necessary to complete the indicator calculations were collected, this research identified each indicator prior to the data collection phase.

Indicators corresponding to an economic approach, but also those relating to ecological and social indicators have been chosen. The reflection around sustainable logistics cannot be restrained to single cost containment. It has to go further where cost rationalization offers a scheme that brings together economic, social and ecological coherence. The approach necessary is multidimensional and needs to rely on indicators corresponding to these different dimensions.

The table 3 below highlights the indicators used within this study and explains why they have been chosen. The three columns to the far right also show the nature of the performance to which each is linked (economic, ecological and social) (cf. table 3).

Table 3 : Chosen indicators for the evaluation of logistics performances for the interviewed farmers

Source: Author, 2014

INDICATOR	UNIT OF MEASURE	INDICATOR'S DESCRIPTION	Economic	Social	Ecological
Delivery distance to retail-wholesale	Km/week	Distance travelled per farmer on average. Enable the calculation of a variety of other economic, ecological and social indicators.	X	X	X
Revenue from retail-wholesale	% of the total revenue	Determines the importance of retail-wholesale outlets in the marketing strategy of the farm.	X		
Weekly revenue from retail-wholesale	€/week	Enables the calculation of the other economic and ecological indicators.	X		
Fuel consumption for retail-wholesale deliveries	l/week	Enables the calculation of economic and ecological indicators.	X		X
Planning	h/week	Enables a social understanding of how the logistics is linked to the amount of labor among farmers that relates to logistics (planning, preparation and delivery).		X	
Order preparation				X	
Deliveries				X	
Total time on logistics				X	
Fuel	€/week	Enables an economic understanding of the details and costs associated with the current logistics.	X		
Planning labor			X		
Preparation labor			X		
Delivery labor			X		
Total delivery	€/week	Economic cost of delivery in its totality (labor and fuel)	X		
Total logistics costs (TLC)	€/week	Highlights the cost caused by logistics (planning, preparation, delivery)	X		
Delivery distance profitability	€ gained / 100 km	Show the profitability of the distance travelled *Example : 100 km of travel brings in x € of revenue*	X		
The cost of logistics compared to revenue	%	Highlights the economic importance of logistics *Example : 1 euro of revenue corresponds to x euro of logistics costs*	X		
GHG emissions	CO_2 Kg/ week	Shows the ecological impact of the logistics *Example : x Kg of CO2 released through logistics on average per farmer per week*			X
Energy intensity	Kg CO_2 emitted / € gained	- Illustrates the ecological impact of the economic activity - Shows the dependence of the revenue for energy *Example: Each euro gained causes a GHG emission of x kg of CO_2.*	X		X
Energy profitability	€ gained / Kg CO^2 emitted	- Shows the economic profitability of the ecological impact - Shows the energy cost dependence of the revenue *Example: Each kilo of emitted CO_2 corresponds to a gain of x euro.*	X		X

The details of the calculations for each of these indicators are situated in the appendix 2 (Cf. appendix 2).

The calculation of some indicators requires determining constants. It is the case for the evaluation of labor costs. It has been chosen to evaluate this cost up to the French minimum wage as detailed in the table thereafter. The fuel price as well as the equivalence between CO_2 emissions per consumed fuel liter has also been determined (cf. table 4).

Table 4 : Constants chosen for the study
Source: Author, 2014

CONSTANTS		VALUE	REFERENCE
Labor force cost		10 €/h	Cost of labor evaluated on the minimum wage in France (In 2014 = 9.53€ gross/h) *http://travail-emploi.gouv.fr/informations-pratiques,89/fiches-pratiques,91/remuneration,113/le-smic,1027.html*
Fuel cost	Diesel	1.31 €/l	Price on June 28, 2014 *http://www.prix-carburants.gouv.fr/*
	Gasoline	1.55 €/l	
GHG emissions	Diesel	2.67 kg CO^2/l	*http://www.futura-sciences.com/magazines/environnement/infos/qr/d/automobile-carburant-emet-plus-co2-essence-gasoil-947/*
	Gasoline	2.28 kg CO^2/l	

Little data exists concerning the performance of logistics in the retail-wholesale sector. Therefore, the construction and the choice of the indicators in table 3 could not be based on an existing methodology. Each one of these indicators has been determined after evaluating existing literature and consulting members of the follow-up body.

Social and economic indicators have been chosen with the help of technical advisers from Gabnor bringing their expertise from the field and knowledge about challenges farmers face. The expert on the LFS logistics (IFSTAAR) also brought her expertise regarding performance evaluation, particularly economic. Ecological indicators have been chosen together with the expert on energy transition and energy costs food, from Virage Energie (cf. table 2 for more information in these experts).

Finally the relevance of all the indicators have been discussed and approved during a meeting of the follow-up body before the collecting data phase, at the end of May 2014.

2.2. Determining the farmer interview sample

The study area is situated in the Nord Pas de Calais region in France and the study concerns the organic sector while focused on the retail-wholesale outlet. Therefore in order to answer

the research questions it has been decided to interview farmers meeting all of the following three criteria:

- Farmers from the Nord-Pas de Calais

- Organic farmers (or transitioning)

- Farmers who rely on retail-wholesale as a big part of their farm marketing strategy. The retail-wholesale needs to involve its own organization, especially for the distribution.

This way farmers who have some marginal retail-wholesale but integrated in logistics of other marketing channels such as direct selling, have not been included in the study (*Example : Delivery for some specialized organic shops periodically, integrated in the CSA delivery route*).

A consultation with the adviser of Gabnor, the organic farmers' organization in the region helped to identify twenty eight farmers meeting the three criteria out of 286 organic farms in the region. It has been aimed to interview all of them. Twenty-one farmers agreed to sit for the interview. It was found that three of the 21farmers interviewed happened to not meet all of the specified criteria. Therefore, at the end twenty one farmers were interviewed but only eighteen were processed for the quantitative analysis, or approximately 72% of the eligible population (18 on 25).

It is important to notice that, even though this study affect a limited number of farmers, it is not less important in the global effort of developing the organic sector. The diversification and organization of distribution channels are necessary to make the organic sector more durable and to accompany its evolution in a context of increasing demand.

2.3. Developing the quantitative questionnaire

A questionnaire enables the researcher to collect quantitative data during the interviews. It has been created for this research in order to obtain the information required to calculate applicable indicators. It leaded to:

- Obtain general information of the farm (revenue, selling points and their nature, type of production)

- Obtain details on the logistics for the retail-wholesale outlets on all logistics steps:

  - *Planning operations :* order anticipation and order management
  - *Physical operations :* storage, order preparation, delivery and handling
  - *Administrative operations :* delivery monitoring and invoicing

The final questionnaire is composed of closed and semi-open questions (Quivy & Van Campenhoudt 1995) and can be found in the appendix (cf. appendix 3). The variable identified as essential to calculate the chosen indicator has been identified in order to be

integrated in the questionnaire. In appendix are the details of these variables along with the details on how they have been collected in a practical way (cf. appendix 4).

3. Identifying inhibiting and supporting factors of logistics collaboration

3.1. Determining the system actors to interview

Logistics collaboration relates to horizontal collaboration between farmers but also vertical collaboration between different actors of the food system. This way, those interviewed for this research is not limited to farmers, but also includes other stakeholders involved in the retail-wholesale local organic food system. As previously discussed, the farmers interviewed were chosen for the evaluation of performances (Cf. section 2.2 of this part). To deepen the study and to get a more holistic view on the organization and problems related to the sector locally, some key actors of the local organic food sector for retail-wholesale in the region have also been interviewed. These actors have been identified through interviews with farmers and the advisers from the organic agriculture organization in the area using the method of snowball sampling (Quivy & Van Campenhoudt 1995). Eight local system stakeholders have been interviewed. Each brought elements and viewpoints from different sectors that rely on logistics collaboration as seen in the table below (Cf. table5).

Table 5 : Identified and interviewed key actors of the studied LFS (Source: Author, 2014)

Name of institution	**Type of entities**	**Role of the interviewee within the entity**
Norabio	**Organic farmers cooperative**	Assignment manager for shops supply-farmers planner
		Vice-president (organic farmer)
Vert'Tige	**Specialized organic shop**	Manager (organic farmer)
2 sous de table	**Restaurant 100% organic**	In charge of supply management
CEB (Ecological and Organic Center)	**Wholesaler for organic products non-perishable**	Manager
SCIC of transportation	**Cooperative Society of Collective Interests**	Driver and manager
Terre d'Opale/ Anges Gardiens	**Platform of production and diffusion of organic/local products**	Manager (Organic farmer)
Croc La Vie	**Institutional catering for early childhood**	Charter member and manager

The details of the table can be found in the appendix with further information on the reason why these stakeholders have been chosen (cf. appendix 5).

3.2. Interview guides for qualitative data collection

Interview guides have been composed in order to guide the exchange toward the identification of supporting and inhibiting factors for logistics collaboration. Open questions orientate the discussion and reflection of the interviewed person toward those questions.

These interview guides are semi-structured in order to avoid digressing from the objectives of the study and allow freedom to explain and explore some perceptions in greater depth. However the interviews stay dynamic and are based on active listening. All the interviews have been conducted between June and August 2014.

3.2.1. Interview guide for farmers

The questionnaire for farmers (quantitative part of the interview) is followed by an interview guide in order to collect the necessary qualitative data, data leading to answer the second and third research questions. The interview guide is built in such a way to:

- Identify the point of view of farmers on their logistics, their interpretation of the progress margin and possible evolution.

- Gather the experiences of collaborations and the farmers' perception, interpretation and perspective on them.

- Gather the farmers' opinions on the interests and obstacles farmers identify regarding logistics collaboration and collective organization.

This interview guide can be found in the appendix (cf. appendix 6).

A maximum of information is gathered in an open way. However, the interview ends with the presentation of grid showing a list of interests and obstacles for logistics collaboration identified during the exploratory phase and re-evaluated during the first interviews. Refer to section 3.3.5 of this material and methods part.

3.2.2. Interview guide for other actors

Interviews with other system stakeholders allowed completing the approach. They enable the researcher to get a broader view on the situation and to improve the understanding of the obstacles and opportunities and to broaden the possible solutions.

Two kinds of actors interviewed can be distinguished:

- Downstream commercial actors: Institutional catering, commercial catering, specialized shops and wholesaler.

- Actors involved in a collaboration scheme: Transportation SCIC (Cooperative Society for Collective Interests), platform of production and distribution, cooperatives.

The objective is to gather, for the downstream key actors, information about the organization of supply particularly for local products, and their points of view on questions relating to local supply in the region (room for transition, difficulties, and identified challenges). For the other actors, the objective is to gather their experiences with logistics collaboration and their perspective on it (difficulties (past or present), evolution (past and future), and room for maneuver).

The interviews are carried out in a flexible way but keep in mind the key elements through the succinct interview guide. The interview guide for stakeholders can be found in the appendix (cf. appendix 7).

3.3. Qualitative data analysis: Analysis of content

The method of "content analysis" has been chosen for the analysis of the qualitative data. This analysis involves transcribing the audio recorded information to then coding the information in order to organize and analyze it (Krippendorff 2003).

The content analysis is composed of four steps detailed hereafter (cf. figure 7).

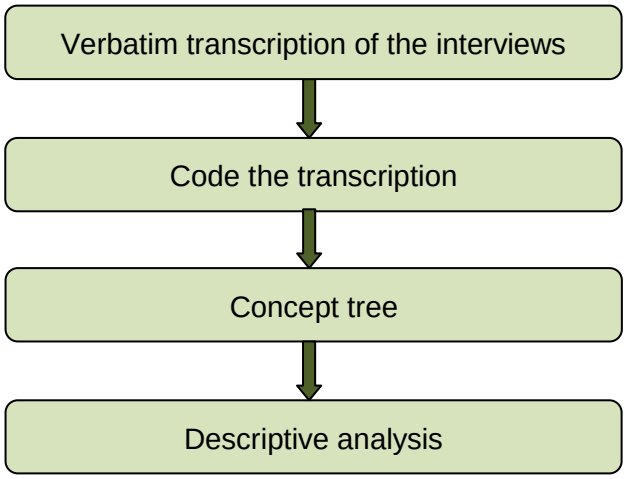


Figure 7 : The steps of the content analysis

Source: Figure realized based on Krippendorff, 2003

3.3.1. Verbatim transcription of the interviews

The content of all the interviews was recorded with a handheld recorder. Then the information was then transcribed. This text is called verbatim and is equivalent to the raw data of the study. The data identified as irrelevant to the topic were not transcribed in order to optimize time.

3.3.2. Code of the verbatim

Each idea of the transcribed text, verbatim, is then matched with a code. The 'idea' is therefore the 'semantic analysis unit' that has been chosen for this study. That way, the text

is cut according to the meaning of the section, the 'key idea' and not taken out of context. The code unit can be few sentences or some words, evoking an idea.

Example:
"There is nothing as good as direct contact with the client. If there is something is wrong, there is immediate exchange and feedback"

Code: Loss of contact with the client

"I don't see myself collaborating with someone who has the same product as me"

Code: Fear of competition

Each part of the text can be matched to multiple ideas and therefore to multiple codes. Those codes have not been chosen before the collecting data phase: this is called "open coding" (Andreani & Conchon 2003).

3.3.3. Concept tree

Once the verbatim is coded, there is a phase more analytic during which codes are grouped in categories.

- First similar ideas which have been matched with different codes are matched to one overarching code

Example: 'lack of punctuality'» and 'Bad handling of the goods' are gathered under 'Bad performances from the partner'

- Then, the different codes are organized and grouped in more general categories. These categories can also be gathered under a wider theme. This way, a concept tree is formed and represents the results of the work. These concepts help to answer the objectives of the qualitative part of the study as illustrated in the figure hereafter (cf. figure 8). Some categories or themes can be codes themselves because they are already general. The construction of this tree is progressive and gradual and is a process that developed throughout data collection (Touboul 2013; Andreani & Conchon 2003). The tree is built with the codes from the farmers' interviews and from the other system stakeholders of the sector.

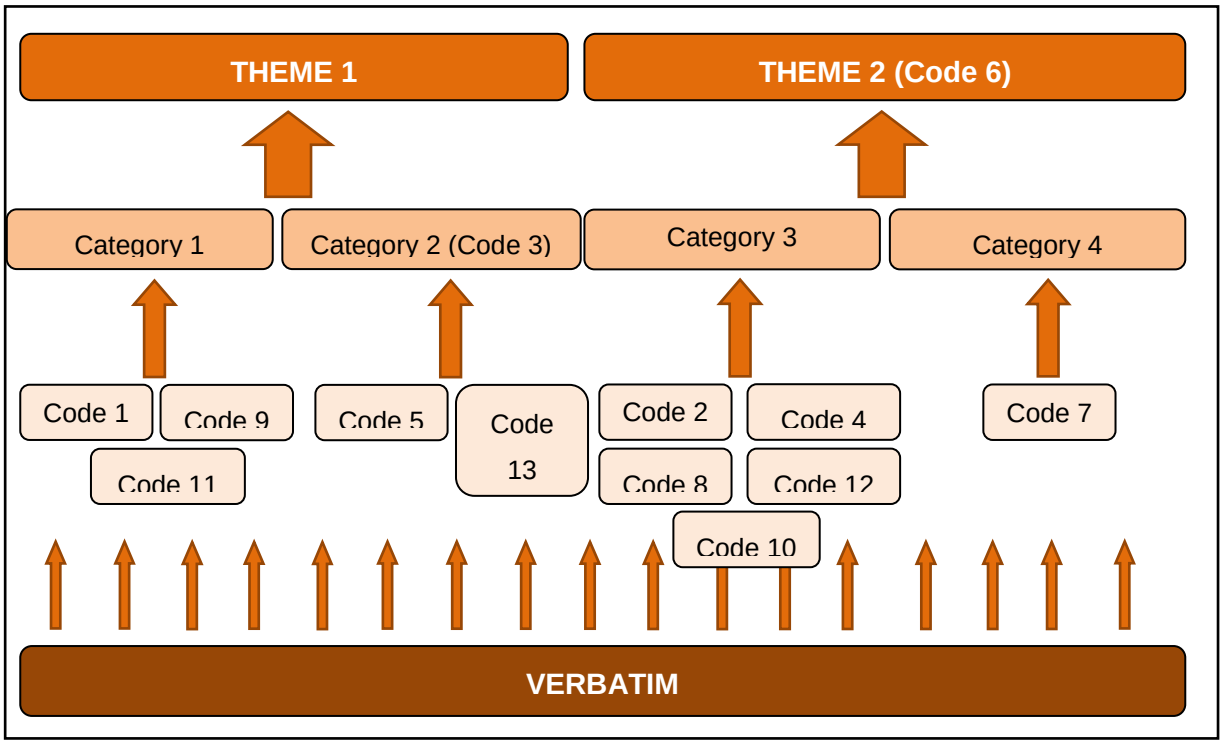


Figure 8 : Principle of the concept tree construction

Source: Figure created based on Touboul, 2013

Each theme, category and code are then explained in a concise way and illustrated with relevant quotes. Each theme, category or code is considered a 'concept' which makes up the concept tree (Touboul 2013).

3.3.4. Descriptive analysis

It is then interesting to see the occurrence of each concept in the various verbatim. This descriptive analysis is only done on the farmers' interviews. Only farmers' interviews have been kept for this descriptive analysis in order to have results on a relatively homogeneous population, a population that has been interviewed with the same interview guide enabling a valid comparison.

Two types of concepts frequencies have been identified as interesting to study:

1) The percentage of interviewed farmers who mentioned the concept (category or sub category) at least once during the interview. This data grasps the importance of the concept in the studied population.

It is calculated this way: $\frac{Number\ of\ farmers\ who\ mentioned\ the\ concept}{Total\ number\ of\ farmers\ interviewed.}$

Example: 62% farmers have spontaneously mentioned 'isolation' as an obstacle for logistics collaboration when only 19% of them spontaneously mentioned 'Difficulty to find a fair system'.

2) The recurrence of the concept in the verbatim for the farmers who mention it. This highlights the importance of some ideas in the discussion when mentioned multiple times throughout the interview.

It is calculated this way: $\frac{Number\ of\ times\ the\ concept\ appears\ (throughout\ the\ verbatim)}{Number\ of\ farmers\ having\ mentioned\ the\ concept\ at\ least\ once}$

The higher the ratio, the more the idea is recurrent and important for the farmers mentioning it. The ratio varies between 1 if the concept is mentioned once during the discussion, and 2.5 (in this study it does not go over 2.5).

Example: The concept 'Bad handling of the goods by partners' has a recurrence ratio of 2.5. On average each person who mentioned the idea mentioned it 2.5 times during the interview. This shows the importance of this obstacle for the farmers mentioning it.

These frequencies are calculated on an individual basis and provide information but do not have real statistic validity.

3.3.5. Analysis of the multiple choice grid

Each farmer interviewed fills in two grids (one for the interests and one for the obstacles to logistics collaboration) numbering from 1 to 3 (one being the most important), the interests and obstacles that they identify as most important for logistics collaboration. These grids can be found in appendix (cf. appendix 8). The analysis of the multiple choice grid is composed using two approaches:

1) The first does not take into account the order given (1 to 3) but rather the simple mention of the interests of obstacles as part of the three major ones. That way it can be seen the percentage of farmers who position various interests and obstacles as major.

Example: 85% of the farmers positioned 'lack of confidence' as one of the three major obstacles to logistics collaboration.

2) The second approach takes into account the order of importance given by the farmers. A system of points is set up :
   - *a.* For position 1 (the most important) = 3 points
   - *b.* For position 2 = 2 points
   - *c.* For position 3 (the least important of the three) = 1 point

Each interest and obstacle receives a sum of points (sum of all the points that have been assigned to it) which weigh the obstacle or interest with the importance assigned by the farmers.

4. Propositions and reflections

The data analysis phase leads to an evaluation of the economic, ecological and social performances of the current logistics in the organic sector for retail-wholesale outlets and also identifies the interests and obstacles perceived by the different actors on logistics collaboration.

The proposition phase has the objective of going beyond the first results to suggest recommendations. This phase is the link between the main ideas from the field and the context into which they fit. It presents a diagnostic, step-by step, of solutions developed from the situation seen through the results. This phase consists of two steps as seen in the figure 9 (cf. figure 9). These steps will be explained in this section.

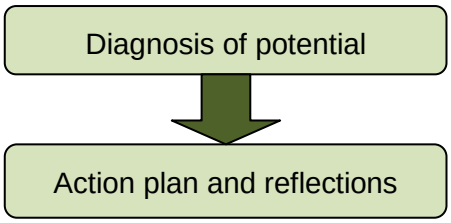


Figure 9 : Steps of the reflection process to lead toward propositions

Source: Author, 2014

4.1. Evaluating the potential of evolution

To start this phase, it has been chosen to conduct a diagnosis of the collected data. To do so, an analysis of evolution is completed. It highlights the strengths and weaknesses of the current and dominant situations as well as the opportunities and threats to take into account for an evolution toward a wanted situation (cf. table 6). The structure of the diagnosis is inspired from the SWOT analysis (European commission-Europaid 2006), but has been adapted to a scheme that evaluate the potential of evolution of the current situation toward a studied wanted situation.

Table 6 : Analysis of evolution

Source : Created based on European Commission Europaid, 2006

	Positive	Negative
Current situation	STRENGHTHS	WEAKNESSES
Wanted situation	OPPORTUNITIES	THREATS

In this research the current situation is an individualistic organization of the logistics of the local organic retail-wholesale sector with few or no vertical or horizontal collaborations (cf. part 4 section 1).The wanted situation is a collaborative organization of the sector actors, economically profitable, ecologically sustainable and socially livable (cf. part 4 section 1). This diagnosis creates a link between the assessment of the evaluation of the logistics performance in the current situation (strengths and weaknesses) and the evaluation of the potential transition toward the wanted situation (opportunities and threats/obstacles for logistics collaboration).

This leads to rely on the weaknesses of the current situation to justify the evolution toward the wanted situation. The means put to make the situation evolve need to rely on the potential of the opportunities but as well to take into account the identified threats. All this is done recognizing the strengths of the current system and trying to keep them in the new one.

1) **Strengths** are the positive points of the current situation
2) **Weaknesses** are the negative points of the current situation. Weaknesses push the situation to evolve toward a different situation: the wanted situation.
3) **Opportunities** are the elements that have been identified as being positive aspects and on which future actions and plans can be built. Opportunities should be taken advantage of.
4) **Threats** are the difficulties, the obstacles that can inhibit the evolution of the situation toward the wanted situation. In this case preventing evolution toward a collaborative logistics of the organic sector for retail-wholesalers in the region. Threats are essential to take into account during the development of projects and action plans (European commission-Europaid 2006).

Once the diagnosis is completed, it is through the relationships between the factors of the diagnosis that the ideas of propositions and action plans appear as illustrated in table 7.

Table 7 : Relations between the factors of the diagnosis of evolution
Source: adapted from European Commission, 2006

			Current dominant situation	
			List of strengths	List of weaknesses
			How to keep the strengths of the current situation?	How to take advantage of the weaknesses of the current situation?
Wanted situation	List of opportunities	How to maximize the opportunities?	How to take advantage of the opportunities to encourage situation evolution while keeping the strengths of the current system?	How to correct the weaknesses of the current situation by taking advantage of the opportunities related to the change of situation?
	List of threats	How to minimize the threats?	How to reduce the threats during evolution of the situation while preserving the strengths of the current situation?	How to use the weaknesses of the current system to lift the threats and obstacles during evolution?

4.2. Future and plan of action

Once the diagnostic of evolution is clear, complete and validated, ideas of action plans and strategies are identified, suggested and discussed. Propositions are described in a way that makes concrete application possible. Then a discussion is carried out on the study and its limits. These reflections can be the starting point for further studies and complementary discussion.

PART 3: RESULTS AND DISCUSSION

This section presents the results and discussion relating to the data collected for this research and is divided in two parts. Each corresponds to one axis of the study as explained in the methodology (Cf. section 1.4 of the materials and methods):

- The first axis of the study is the evaluation of the economic, ecological and social performances of logistics in the local food system concerning the organic retail-wholesale sector. (Addresses research question 1)

- The second axis concerns the identification of the supporting and inhibiting factors for logistics collaboration. This will be presented through exploring the interests and obstacles perceived by farmers and other organic retail-wholesale actors involved in logistics collaboration as well as the possible forms that logistics collaboration can take. (Addresses research question 2 and 3)

1. Evaluation of logistics performances

In this section, results concerning the current farmers' logistics are presented and discussed. The lack of existing references regarding farmers' logistics performances made it difficult for the results to be compared with a frame of reference. However, this study fit into a process of reference building and therefore the comparison and analysis of farmers amongst themselves is completed.

1.1. General characteristics of the interviewees

Of the 21 farmers interviewed, the quantitative data are based on only the 18 fitting to the sample characteristics as outlined in the methodology (cf. part 2, section 2.2). In order to keep their anonymity, numbers have been attributed to farmers. For improved readability, they have been grouped per production type as seen in the following table (cf. table 8). This allows the reader to easily recognize obvious differences or similarities between production types.

Table 8 : Interviewed farmers brought to anonymity and grouped by products

Source: Author, 2014

Production type (Color coding used in some charts)	**Vegetable**	**Orchards**	**Dairy products**	**Meat products**	**Bread and grains**
Corresponding number in the graphs	N° 1 to 8	N° 9 to 12	N° 13 to 16	N° 17	N° 18

On average for the sample interviewed, the revenue for retail-wholesale of the farms is 46% of the total revenue. This varies much depending on the farm, going from 5% to 100% of the revenue as we can see in the following graph (cf. figure 10). However, it is important to remember that for all the farmers, this distribution channel leads to a distinct method of logistics organization, particularly concerning delivery.

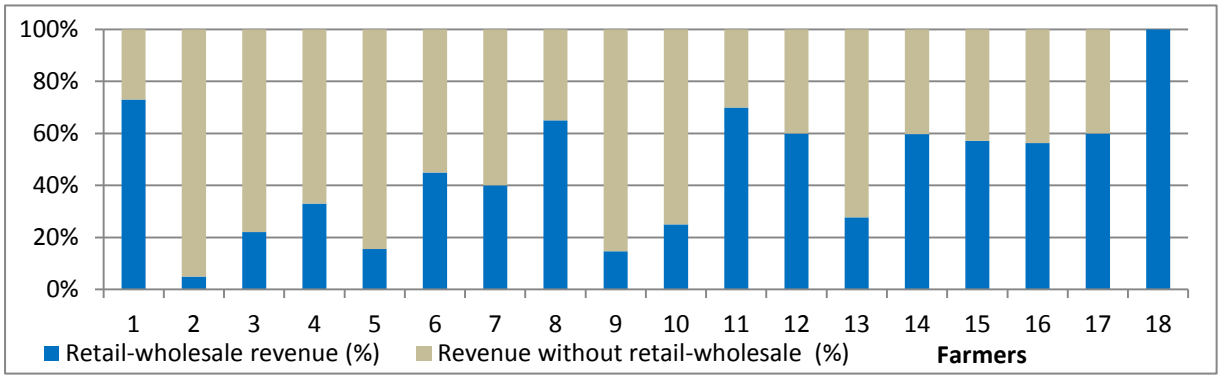


Figure 10 : Importance of retail-wholesale in the farm revenue

Source: author, 2014

The marketing channel on average corresponds to 2.6 types of selling modalities[3] for retail-wholesale with 5.3 modalities total average on the farm (cf. figure 11). This illustrates the high variety of distribution channels per farm as well as in retail-wholesale. This brings complexity to the organization as each modality has specific constraints.

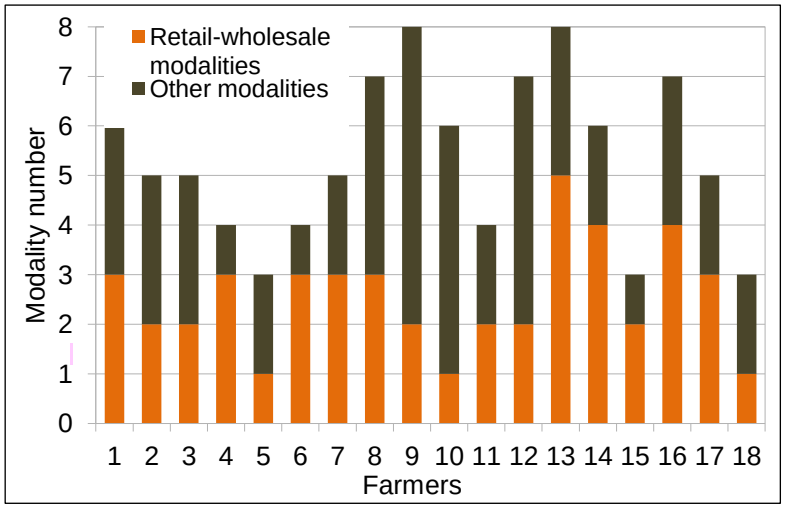


Figure 11 : Distribution of retail-wholesale modalities on farms marketing strategies

Source: Author, 2014

There is an average 20.4 different selling points per farm. Half of them (10.1 per farm) relate to retail-wholesale with differences depending on the farms as the figure 12 shows (cf. figure 12). The number of selling points seems to be correlated to the type of production. Farmers producing diversified vegetables (n°1 to 8) have an average of 7.25 selling points and 4.5 of them for retail-wholesale when the farmers in arboriculture (n° 9 to 12) have an average of 19 selling points for 10 in retail-wholesale. The farmers producing dairy products (n°13 to 16) have a significant number of selling points with an average of 51, mainly caused by one farm having 120 selling points. This variation in the number of selling points can be partly explained by the products sold. Cheese for example is a value added product with a lower stock rotation than vegetables for instance. It is then necessary to have more selling points for cheese as lower amounts are sold at each point.

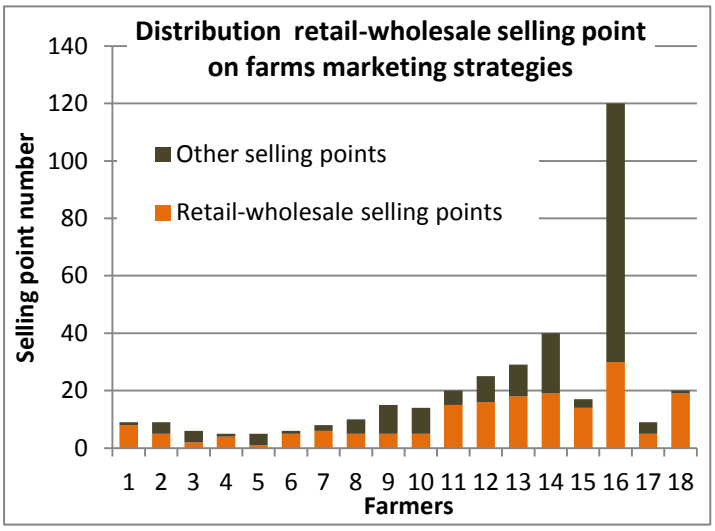


Figure 12 : Distribution retail-wholesale selling point on farms marketing strategies

Source: Author, 2014

[3] Homogeneous class of selling points (for example institutional catering, shops or farmers' shop in retail-wholesale sector)

However overall, the high number of delivery points in the sample illustrates the characteristics given for retail-wholesale (cf. part 1, section 4.5). The high number of selling points and the variety of modalities reveal the corresponding logistics organization challenges.

The delivery distance farmers travel for retail-wholesale ranges between 60 and 1500 kilometers per week for an average of 293. While almost half of the farmers travel less than 200 km per week (8 on 18), 4 travel more than 300 as shown in the figure 13 (cf. figure 13).

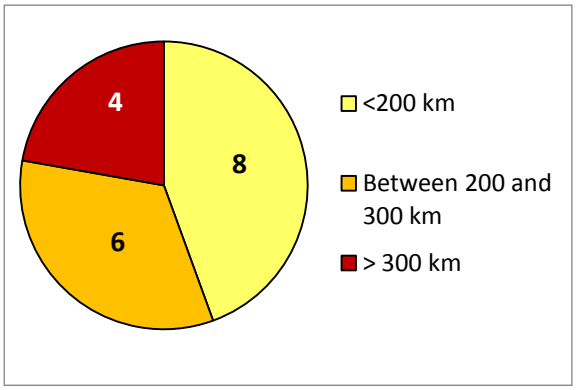


Figure 14 : Distance farmers travel for retail-whole sale deliveries in km/week (N=18=100%)

Source : Author, 2014

It is important to notice that the delivery distance does not always correlate with a larger number of selling points as illustrated in the figure 14 (cf. figure 14). It is highly dependent on the logistics organization of each farmer's system and its unique characteristics such as geographic situation of the farm and products delivered. Some products need to be delivered fresh and therefore more frequently than others such as leafy and fragile vegetables (farmers n°1 to 8) or bread (farmer n°18). Farmer 18 is a good example of this and produces bread requireingalmost daily delivery to 20 selling points. Creating an efficient logistics organization is then important because it directly affects the revenue of the farm and the labor hours concerning logistics.

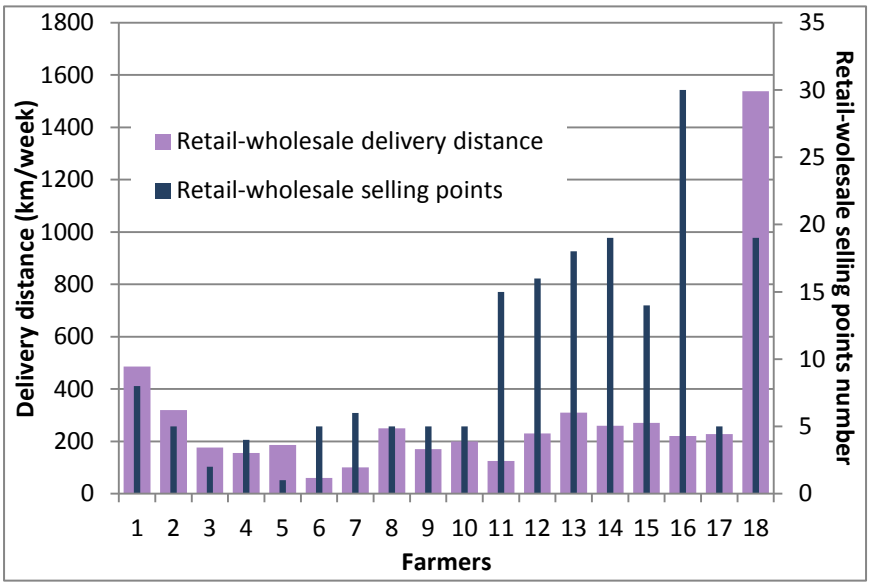


Figure 13: Delivery distance and selling points number

Source: Author, 2014

In order to aim for a sustainable logistics organization for the organic food system in retail-wholesale, the evaluation of performances needs to be multidimensional. Logistics reflection needs to go beyond the cost rationalization and have an ecological and social dimension as well. The analysis of the logistics organization performances has different levels of evaluation: An economic approach, an ecological approach and a social approach.

1.2. Economic dimension

Logistics costs are not often taken into consideration by farmers who have little awareness of the costs that their organization requires. It is more specifically the time spent for logistics that is not considered working hours. The evaluation of economic performances of logistics has an objective to highlight the real cost implied by the logistics if an hour dedicated to logistics is paid as such (French minimum wages[4]). The results found are displayed below and involve details on the distribution of costs depending on the logistics items but are also shown in relation to the revenue and delivery distance for retail-wholesale activity (cf. table 9):

Table 9 : Results of the evaluation of economic performances of interviewed farmers logistics

Source: Author, 2014

		Minimum	**Average**	Maximum
Planning costs	€/week	3	27	150
	% of logistics costs	2%	**14%**	59%
Order preparation costs	€/week	10	50	200
	% of logistics costs	7%	**29%**	58%
Delivery labor costs	€/week	30	60	140
	% of logistics costs	16%	**37%**	53%
Fuel costs	€/week	7	32	101
	% of logistics costs	5%	**20%**	34%
Delivery costs (delivery labor + fuel)	€/week	42	92	241
	% of total logistics costs	21%	**57%**	87%
Total logistics costs	€/week	79	**169**	438
Ratio logistics costs versus revenue	% of the revenue	4%	**23%**	62%
Profitability per kilometer	€ gained/ 100 km travelled	100	**574**	3036

[4] French minimum wage is 9.53€ /hour gross. Round up at 10€/hour for the study

The figure 15 highlights the distribution of the different logistics costs per farmers. Some trends appear for similar products on certain logistic items such as preparation costs as described hereafter.

The planning costs take into account the time spent on client relations, order taking and other administrative tasks (cf. part 2, section 2.1). The planning costs vary greatly depending on the individual systems but also the products for sale. Planning cost varies from 3 € per week to 150 € and can represent from 2 to almost 60 % of the logistic costs (cf. table 9). The significance of these costs often correlates to a high number of selling points.

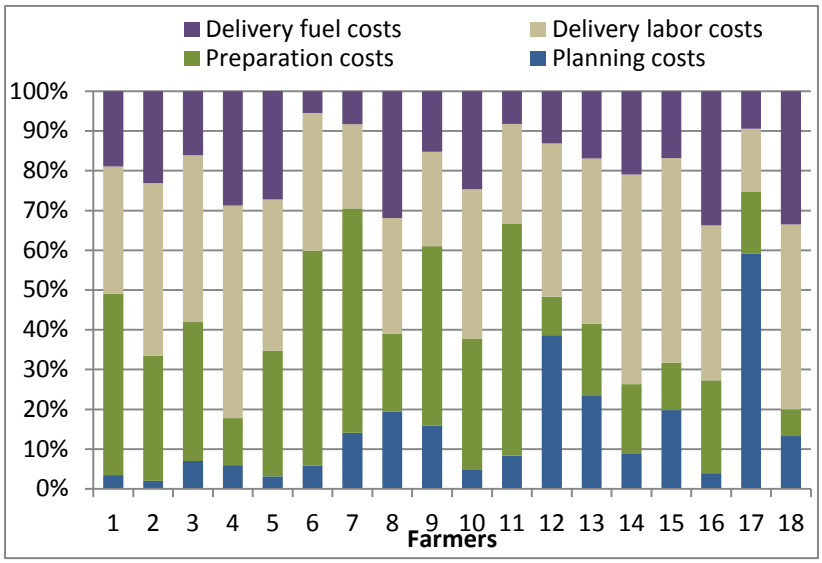


Figure 15: Distribution of logistics costs for farmers

Source: Author, 2014

Order preparation costs take into account the time spent to prepare orders (sorting, cleaning, packaging or making batches for example). These costs can range from 10 € to 200 € per week and represent an average of 29% of the logistics costs. They highly depend on the products. Indeed, the vegetable and orchard farmers (farmers 1 to 12 in figure 15) have products that require time to sort, clean or box compared to other products such as cheese, meat or bread.

Delivery is the main logistic cost. It represents by itself 57% of the logistic costs and can go up to 87% in the sample interviewed for this study. It takes into account the delivery labor cost (time spent in transit and at the clients) and the fuel costs. Labor represents 37% of the delivery costs and is rather homogeneous depending on the products as illustrated in the figure 15. 20% is the average fuel costs. It depends on the delivery distance and the type of vehicle used. Even though it is not the highest logistics cost, it is important to take into account in the current context of the fossil fuel crisis and increasing energy prices.

One of the most interesting economic indicators is the ratio of logistics costs versus revenue. This one assesses the percentage of the revenue dedicated to logistics costs. On average 23% of the revenue is spent on logistics costs. This means that for each euro gained, 0.23 euro is spent for logistics. One farmer of the sample uses 0.62 € of logistic costs for each euro gained. However, this can be explained by an marketing strategy based on an online

ordering system for delivered boxes[5], which requires a lot of travel far from the farm, a lot of time to prepare the individualized boxes for the consumers, as well as the time necessary for the delivery (two hours per delivery points). It is interesting to see the difference of the logistics costs versus revenue ratio (representation of average ratio for the different production in the figure 17). This ratio is the most important for vegetables farmers with an average ratio up to 34%. This can be partly explained by the preparation costs being more important for this product along with low added value to the final product and the need for freshness implying a high frequency of delivery. Almost all 5 farmers who have a logistics costs versus revenue ratio of over 34% we can see in the pie cart (cf. figure 16) are vegetable farmers (4 on 5) when all those that have a ratio under 11% produce high added-value products such as cheese, processed meat, bread or cider (cf. figure 15 and 16). This illustrates how product characteristics influence this ratio.

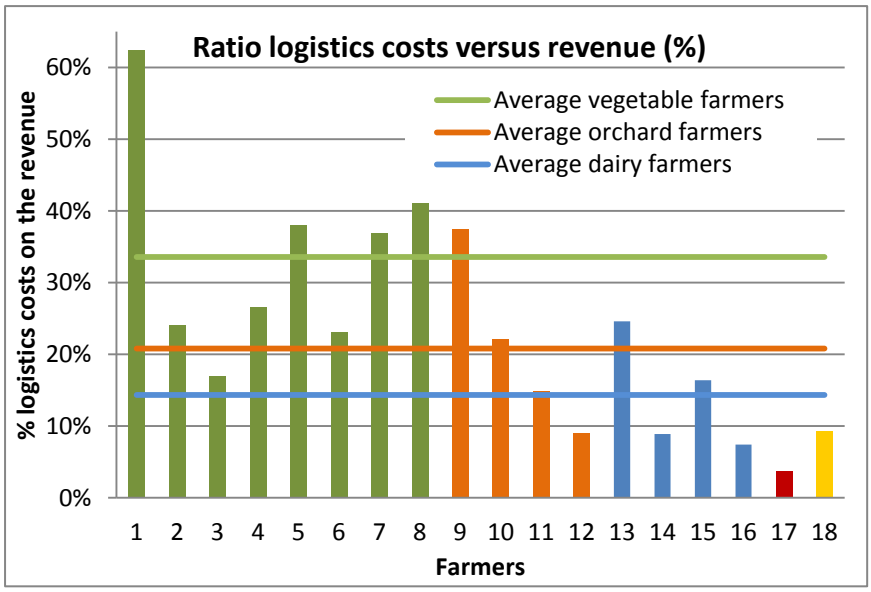


Figure 16 : Ratio logistics costs versus revenue (%)

Source: Author, 2014

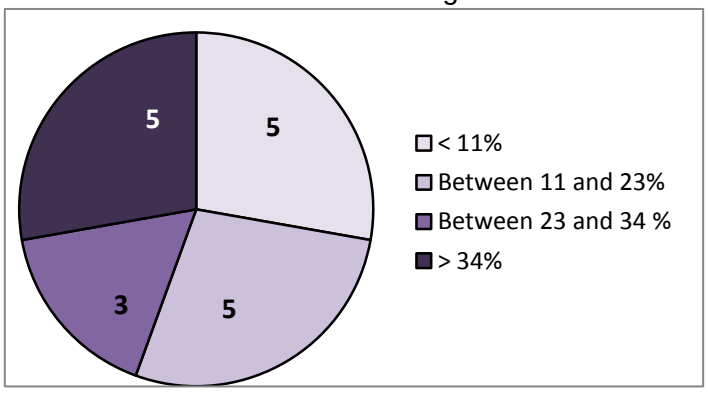


Figure 17: Distribution ratio logistics versus revenue in the sample interviewed (N=18)

Source: Author, 2014

Another interesting indicator is the delivery distance profitability revealing the amount of money gained per 100 km travelled. The average delivery distance profitability for the sample interviewed is 574 € per 100 km

[5] Created 3 years ago in France, 'La Ruche Qui Dit Oui' is an internet platform linking farmers and consumers. It is online-selling tool. With 10% of the revenue transferred to the company in charge of the website and 10% to the delivery point, this modality has been considered as retail-wholesale in this study (price close to the wholesale market). *www.laruchequiditoui.fr/*

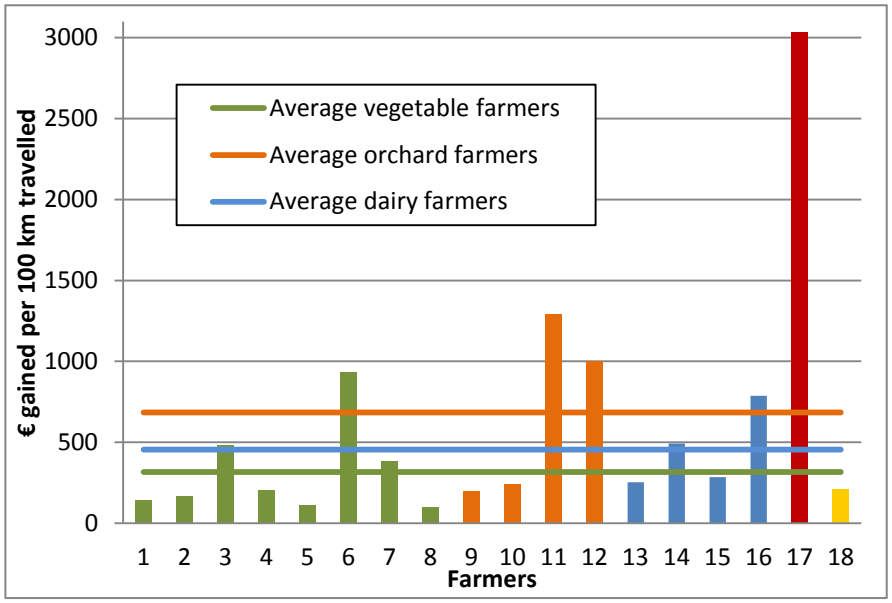


Figure 18 : Delivery distance profitability (€ gained for 100 km travelled)

Source: Author, 2014

travelled. However the variations are important as seen in the figure 18. When 5 farmers have a delivery distance profitability lower than 200€ per 100 km travelled, the same amount gain more the 700 € for the same distance travelled (cf. figure 18). If we put aside the meat farmer (n°17 on the graphs) who has a high value-added product (meat) and a very specific selling system (a unique shop), the average goes down to 429 € for 100 km travelled. With no surprise the average delivery distance profitability is the lowest for vegetable farmers, down to 316 € per 100 km travelled (cf. figure 18). This is in accordance with the analysis made on the difference of the results for the ratio logistics costs versus revenue made above. Vegetable farming produces a low added-value product and has then lower delivery distance profitability than other production for a similar delivered volume. The load's worth highly influences this indicator. For orchard farmers, even though the added-value of the final product is low, the good preservation capacity of the fruits (mainly apple in the region studied), leads to a lower delivery frequency and that way a better optimization of the deliveries through bigger volume for the same selling point.

However, when looking at these results it is important to be aware that these indicators don't take into account the production costs but only the logistics costs. Even though they have economic indicators which seem better than vegetable farmers especially, livestock farmers have much higher production costs.

1.3. Ecological dimension

The ecological impacts of LFS are discussed today within the scientific world in relation to a low logistics rationalization as seen previously (cf. part 1, section 3.2). Ecological indicators have been calculated in this study to evaluate the farmers' ecological performances of logistics for their retail-wholesale selling points. For a lack of valid data on the weight and volume delivered per week (seasonality and large variety of products for a same farmer), most of these indicators are based on economic data. The results of this ecological approach are gathered in the table thereafter (cf. table 10).

GHG emission has been calculated per year. It is 3.3 tons of CO_2 emitted on average per farm interviewed concerning the retail-wholesale logistics activities (cf. table 10).

The other indicators have been evaluated in relation to the revenue in absence of data on delivery volume of weight. This makes it difficult to compare systems having different products, especially if the value added is very different.

Table 10 : Results of the evaluation of logistics' ecological performances of the interviewed farmers

Source: Author, 2014

		Minimum	Average	Maximum
GHG Emission (Tons CO_2 emitted/year)		0.8	**3.3**	10.7
Energy intensity	Kg CO_2 emitted/100€ gained	0.7	**9.2**	26.7
Energy profitability	€ gained/ kg CO_2 emitted	3.7	**25.1**	142.2

The calculation of the energy intensity highlights the ecological impact of the economic activity. In our sample the average energy intensity is 9.2 kg of emitted CO_2 for 100 € gained.

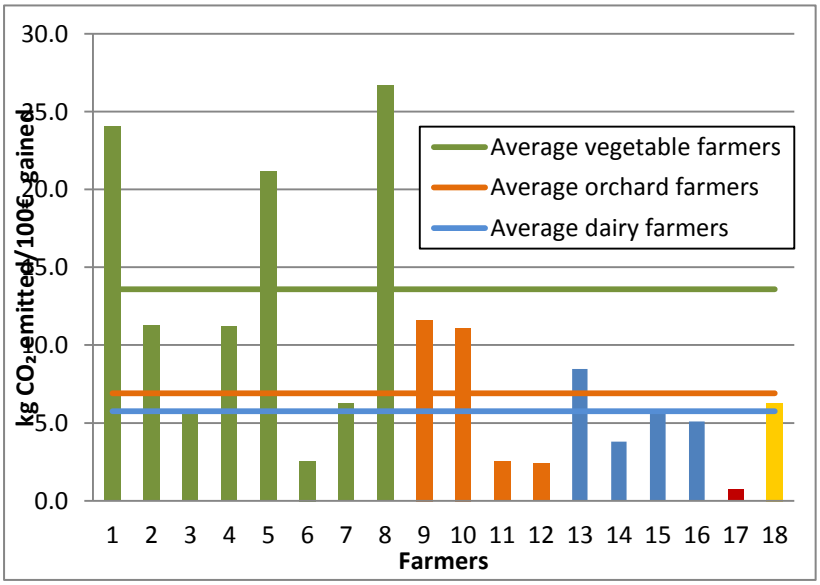


Figure 19: *Energy intensity of the interviewed farmers (kg emitted CO_2 /100€ gained)*

Source: Author, 2014

The detail of this indicator per farmers on the figure 19 shows the disparity of the results depending on the farmers and the products (cf. figure 19). The energy intensity seems higher for vegetable farmers than for other types of farmers (average of 13.6 kg of emitted CO_2 per 100€ gained compared to an average of 6 kg of

CO_2 for the others). The differences within the same category of farmers however, are difficult to analyze. The energy intensity depends on the proximity of consumer pool (city or touristic area), the quantity of delivered products (value of the delivery) and the distribution strategy of each individual farm. The limited number of farmers representing the same type of production limits the in-depth analysis of this study. Only a hypothetic reflection can be done.

The energy profitability shows the economic profitability of the ecological impact, that is to say the money gained per kilogram of emmited CO_2. When the average is 25.10 € gained per kg of emmited CO_2, almost all the vegetable farmers are under 20 € with an average at 13 €. The energy profitability reachs 25 € for orchard farmers (cf. figure 20). This difference with vegetable farmers is parlty due to the different preservation capacity of the products as said before (cf. part 3 section 1.2). The logistic stakes are especially high for vegetable farmers caused by the characteristics of production. The very high profitability the farmer 17 as explained in the previous section (cf. part 3 section 1.2), is due to the products, meat, which has a high price per kilo, and the distribution strategy on a single farmers' shop.

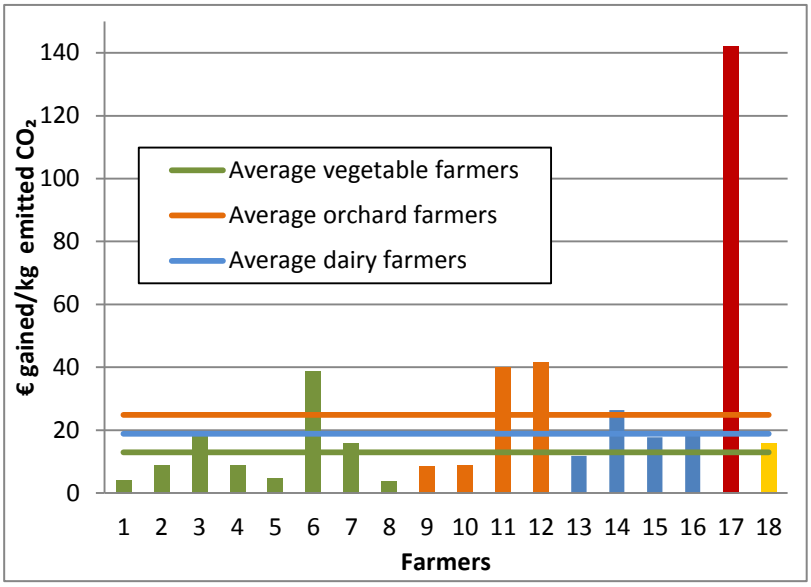


Figure 20 : *Energy profitability of the interviewed farmers (€ gained/kg emitted CO_2)*

Source: Author, 2014

Logistic rationalization would lead to a diminution of the energy intensity as well and an improvement of the energy profitability on the different systems.

1.4. Social dimension

One of the main reflections from farmers regarding logistics is about time management. Time distribution is a recurrent subject talked about during the farmer interviews (time spent in transportation and selling takes away from their primary job: production). However, even if reflection exists on the topic, working hours spent on logistics are often not considered as 'working' hours for farmers. Information on the time dedicated to logistics is important to highlight this often neglected element. The table 11 summarizes the data obtained which is related to the social performance evaluation (cf. table 11).

Table 11 : Results of the evaluation of logistics' social performances of the interviewed farmers

Source: Author, 2014

	Minimum	Average	Maximum
Planning time (h/week)	0.3	2.8	15.0
Preparation time (h/week)	1.0	3.9	20.0
Delivery time (h/week)	3.0	5.6	14.0
Logistic time (h/week)	**5.8**	**12.5**	**35.5**

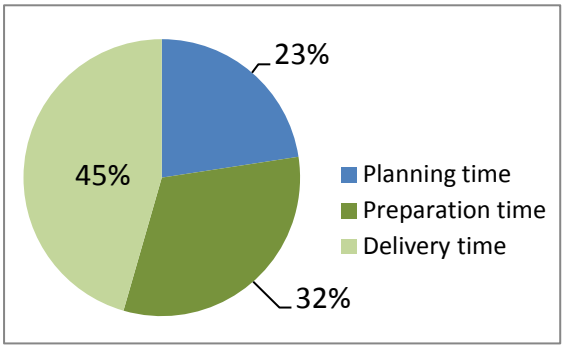


Figure 21 : Distribution of logistics time management

Source: Author, 2014

On the 18 interviewed farmers for this quantitative approach, the average logistics time is 12.5 hours per week which is more than one full day of work (cf. table 11).

As the figure 21 illustrates, almost half of this logistics time corresponds to delivery. However planning and preparation also have their importance. Almost 4 hours per week are dedicated to preparing orders on average and 3 hours for planning.

The detail from farmers' logistics time management is shown in the figure 21 depicts a large degree of heterogeneity. Vegetable farmers (n° 1 to 8) have lower amount of time dedicated to logistics than others in general. However, to make assumptions for other production types

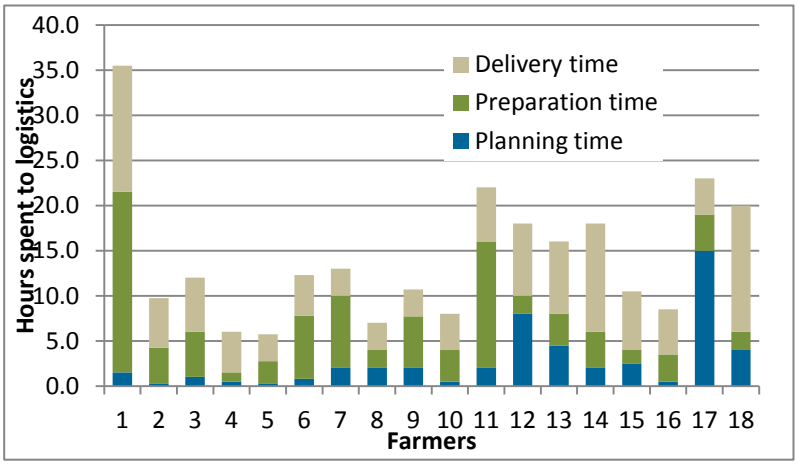


Figure 22 : Logistics time management for farmers

Source: Author, 2014

seems difficult when looking at the orchard farmers (9 to 12 in the graph) and dairy farmers (13 to 16). The distribution of time for logistics is mainly due to the internal organization of each farm. As we explained in section 1.2 of the part, Farmer 1 mainly sells his products though La Ruche Qui Dit Oui, the online platform explained page 45, modality which demands a lot of time for order preparation and, in this specific case, delivery time (delivery points far from the farm). This explains the high amount of time spent for logistics (35.5h/week). Farmers 17 and 18 have specific logistics challenges due to their production (meat for the 17 and bread for the 18). We can see that the logistics strategy of the meat farmer requires a lot of *planning* hours (many clients even if one selling point), while the farmer producing bread has a big portion of his logistic hours for daily *delivery* all over the region.

The distribution of the hours spent on logistics is that half of the farmers spend between 35 minutes and 2 hours per week for planning as shown in the figure 23. It is interesting to notice that almost 1 farmer in 3 spend more than 2h30 for *planning* the retail-wholesale deliveries. For *preparation*, 1 farmer in the 3 spent between 2 and 4 hours (cf. figure 24). However, 1 on 3 spent more than 5h30 on preparation, mostly vegetable farmers. As previously discussed in section time dedicated to logistics is often reduced to deliveries. However, as shown in the graphs below, planning and preparation are also to taken into

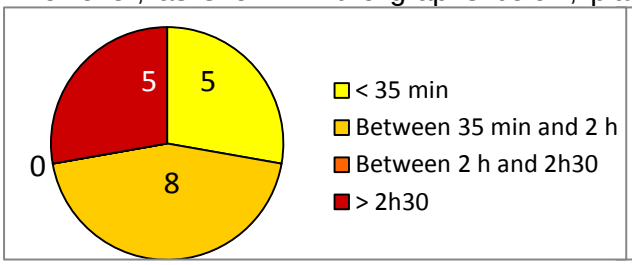


Figure 26 : Distribution of farmers depending on planning time for retail-wholesale (per week)

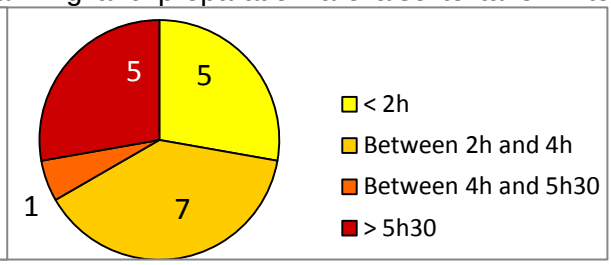


Figure 25 : Distribution of farmers depending on preparation time for retail-wholesale (per week)

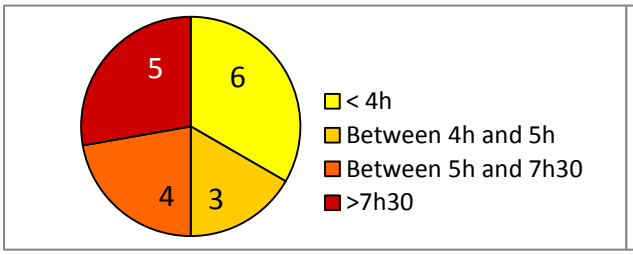


Figure 24 : *Distribution of farmers depending on delivery time for retail-wholesale (per week)*

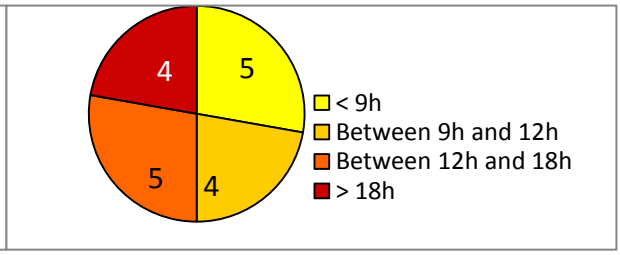


Figure 23: Distribution of farmers depending on total logistics time for retail-wholesale (per week)

Source: Author, 2014

account in the farmers' reflection regarding logistics organization and rationalization. For deliveries, the contrast is important as shown in the figure 25. When 1 on 3 farmers spend less than 4 hours for deliveries per week, almost as much spend more than 7h30 (cf. figure

25). This time for delivery seems especially important for dairy farmers in cheese production (farmer 13 to 16 in the detailed figure 22) due to a high number of selling points for small amount of product.

This section has shown that the hours farmers spend on logistics vary greatly depending on their logistic organization as well as the characteristics of their products.

1.5. Logistics performance assessment

The results of this evaluation of farmers' logistics performance have highlighted the uniqueness of each farm's logistics organization. However, trends appeared depending on each farm's products. The effects of the logistics organization strategy depend on the characteristics of the products. The economic impact of higher logistic efficiency varied greatly depending on the type of products. As summarized in the table hereafter (cf. table 12), the added-value of the final product, the necessary delivery frequency and the logistics costs versus revenue ratio all help to determine the overall economic impacts relating to the implementation of an effective logistics strategy.

Table 12 : Economic necessity to have an efficient logistics depending on the characteristics of the products

Source: Author, 2014

	Vegetable farmers	**Orchard farmers**	**Dairy and meat farmers** (cheese, and other high added-value products)
Added-value of the final product	Low	Low	High
Delivery frequency (freshness needed for the delivered product)	High	Low	Low
Part of the revenue dedicated to logistics (logistics costs versus revenue ratio)	High	High	Low
Economic necessity to have an efficient logistics	**High**	**Medium**	**Low**

The economic necessity to have efficient logistics varies depending on the type of products produced on the farm. Main characteristics of the products impact this necessity differently:

Characteristics not having much impact on the necessity to have efficient logistics

Characteristics deeply impacting the necessity to have efficient logistics

Changes in logistic organization appear to affect most vegetables farmers' economic performance as they are selling a low added -value product with a high delivery frequency. The part of the revenue dedicated to logistics is high whence a high economic necessity to have an efficient logistics.

The various impacts of the logistics organization have been highlighted in this section, from the economic to social or ecological impacts. This multidimensional aspect of logistics shows the importance for a general reflection on logistic organization and its rationalization.

Logistic collaboration is a rationalization tool as explained in the section 4.4 of part 1. This tool appears as interesting and able to adapt to a local reflection on logistic organization of the organic retail-wholesale food system. However, developing sustainable logistic collaborations, whatever its form is far from easy. The second part of this chapter will evaluate the situation regarding logistic collaboration focusing on its perception for farmers or other stakeholders of the local organic retail-wholesale food system. First the interests will be presented and then the obstacles that face logistics collaboration vocalized by farmers and other stakeholders from the studied food system as well as possible forms that logistics collaboration can take.

2. Logistic collaboration: Inhibiting and supporting factors

The interviews as well as the exploratory phase highlighted interests and obstacles for logistics collaboration. Even though the focus thus far has been on farmers, key actors of local organic food system for retail-wholesale take are also included in the study (cf. part…method). This section will first explain the interests identified by the actor of the local organic food system for retail-wholesale (farmers and other interviewed stakeholders) regarding logistics collaboration then go over obstacles identified in terms of horizontal and vertical collaboration. Finally, five main forms of logistic collaboration will be explained, forms that has been vocalized by the actors or read in literature.

Inhibiting and supporting factors are essential to take into account in a broader reflection about developing sustainable organic local food systems in retail-wholesale sector as well as other distribution channels.

Once knowledgeable about this information, it becomes possible to work on schemes inspired by existing forms of logistics collaboration while paying attention to identified obstacles. Existing projects and future ideas can then bring solutions to overcome these obstacles. The identified interests help the actors (especially farmers) understand expectations and concerns, in order to enable them to adapt and set up projects that fit to those expectations.

This part is based on the “content analysis” of the transcribed interviews of twenty one farmers and seven key stakeholders of the local organic food system for retail-wholesale. The quantitative data of this part are based on the analysis of the interviews of farmers only as explain in part 3.3 of the methodology. They are based on:

- The descriptive analysis of the content analysis (cf. part 2, section 3.3.4)
- The analysis of the multiple choice grid presented to the interviewed farmers (cf. part 2, section 3.3.5)

The reflection of the seven other key actors of the local food system in the region have been taking into account to support the results of the farmers interview and to bring more holistic vision of the subject, a vision on the food system scale.

2.1. Logistic collaboration: Multiple interests to support

One of the interesting results of this study is the identification of logistics collaboration interests but more than that the understanding of the farmers' perception on it. Indeed, it is important to integrate the farmer's view in the reflection about logistic optimization in the local food system. Identify the main interests they associate with logistics collaboration can highlight the main driver of change and that way fit as much as possible a potential change to their realities.

The analysis of the multiple choices grid presented to farmers gives the following results (cf. figure 27).

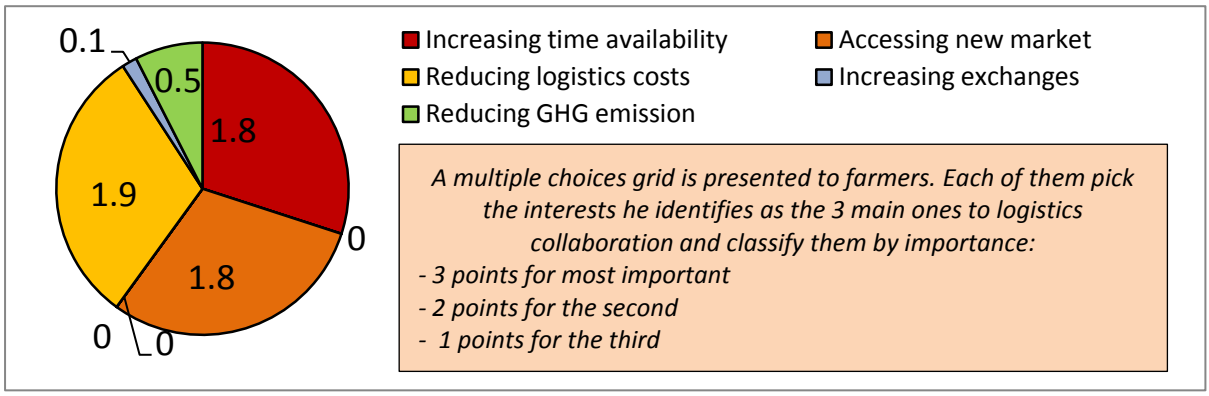


Figure 27 : Average points given by farmers to the different logistics collaboration interests

Source: Author, 2014

Five interests associated with logistic collaboration have been identified by the content analysis done:

- Reducing logistics costs
- Increasing time availability
- Accessing new markets
- Reducing GHG emission
- Increasing exchanges

Among these five interests associated with logistics collaboration this pie chart (cf. figure 27) emphasizes the importance of three of them for farmers: logistic costs reduction, increasing time availability and new market opening up. These interests include various categories depending on the farmer's approach of the interest. It is interesting to take into account the various approaches to be the most accurate possible in the propositions. The following graph shows the percentage of farmers having mentioned the different interests (cf. figure 28):

- In their spontaneous reflection during the interview (content analysis)
- In a more guided reflection after introduction of the multiple choice grid. Interests that they identified as part of the 3 most important one (multiple choice grid analysis)

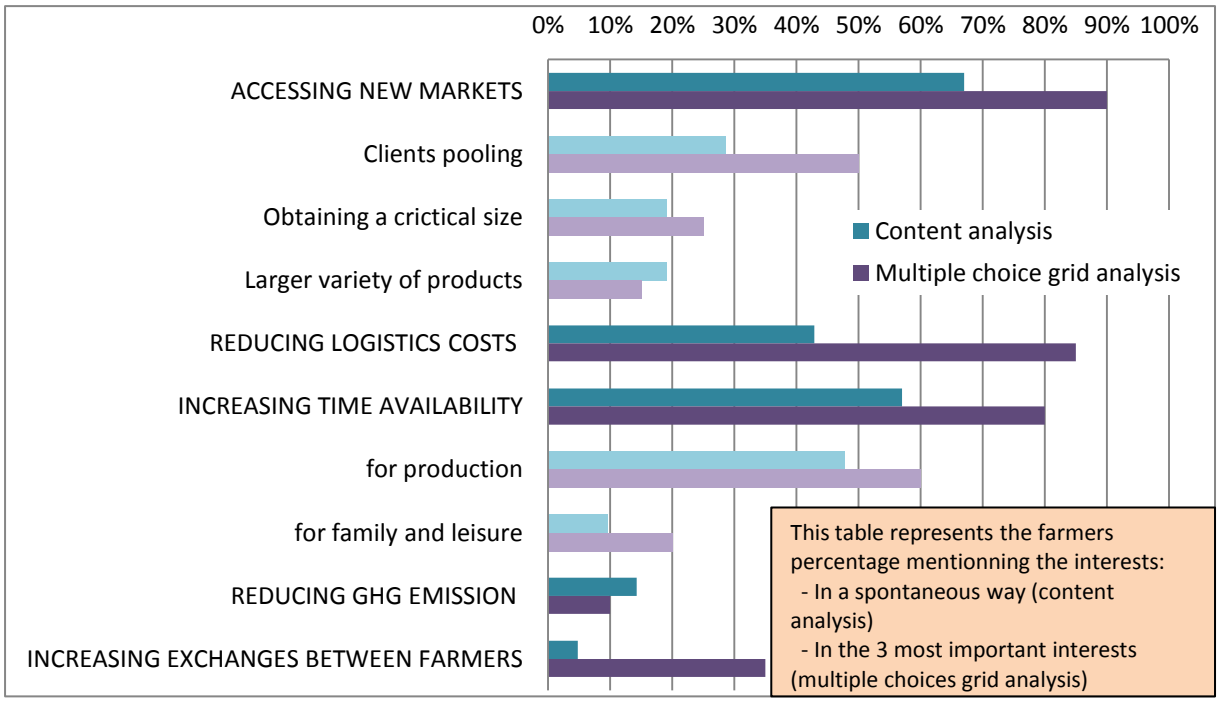


Figure 28 : Logistics collaboration interests identified by farmers (Grid and content analyses)

Source: Author, 2014

It is interesting to notice the main trends but also perceive the results variations between these two reflection mode (spontaneous and guided) illustrated in the figure 28. Some interests are not spontaneously mentioned by the farmers but once identified they take all their importance. It is the case for the logistics costs reduction as explained more in details later in this part, in the section 2.1.3.

The following tables (table 13 and 14) gather the main results of the quantitative analysis. The first one show the details of the descriptive analysis of the content analysis when the second one the results of the multiple choices grid analysis. The complete table is to find in the appendix (cf. appendix 9).

Table 13 : Results of the descriptive analysis of the content analysis-Interests of logistics collaboration (Source: Author, 2014)

CONTENT ANALYSIS					
THEME	**CATEGORY**	**PRECISIONS ON THE CATEGORY**	**Percentage of farmers having spontaneously mentioned this interest during the discussion**		**Recurrence of this interest on the speech of the farmers mentioning it**
Interests to logistics collaboration	Accessing new markets	Client pooling	29%	**67%**	1
		Obtaining a critical size	19%		1
		Larger variety of products	19%		**2**
	Increasing time availability	For production	48%	**57%**	1.6
		For family and leisure	10%		**2.5**
	Logistics costs reduction		**43%**		1.1
	GHG emission reduction		14%		1
	Increasing exchanges between farmers		5%		1

Table 14 : *Results of the analysis of multiple choice grid -Interests of logistics collaboration (Source: Author, 2014)*

MULTIPLE CHOICE GRID ANALYSIS			
THEME	**CATEGORY**	**How many farmers chose it as part of the 3 major interests**	**Average points given for this interest on the sample (on a scale from 1 to 3)**
Interests to logistics collaboration	Accessing new markets	**90%**	**1.8**
	Increasing time availability	**80%**	**1.8**
	Logistics costs reduction	**85%**	**1.9**
	GHG emission reduction	35%	0.5
	Increasing exchanges between farmers	10%	0.1

Now the different interests to logistics collaboration will be detailed and explain.

2.1.1. Accessing new markets

Opening new market appears as the main perceived interest for the interviewed farmers. 14 farmers on 21 mentioned it spontaneously during the interview and 19 on 21 chose it as part of the three main interests to logistics collaboration after the presentation of the multiple choice grid. This opening to new market is associated to three different reasons:

- Client pooling: Collaboration can create new markets opportunities because, as this farmer explains:

> *"Maybe that collaborating will enable me to get into some shops where I don't go, into places where another one goes" (Farmer18, Interview 01 July 2014)*

- Obtaining a critical size: As this farmer explains,

> *"Sometimes people have the feeling that farmers are so small it is not even interesting to work with them […] we could carry a bit more weight" (Farmer 15, Interview 23 June 2014)*

Indeed, certain forms of collaboration lead to bigger volumes for sell through production pooling from multiple farmers. This can enable farmers to reach markets that were individually impossible to reach such as institutional catering.

- Larger assortment: Collaboration can also enable an increasing products diversity offered for sell (variety of products linked to a variety of farmers and productions). This is interesting for the clients who then have to deal with a single contact to gather the products that interest them. It is the opinion of the interviewed wholesaler/distributor:

> *"As a result (speaking about collaboration and pooling of products) there is a true offer and we give a visibility to the regional products for other regions. We don't need to work local where the offer already exist, but people like me it is to work out of the region"(Distributor, Interview 28 July 2014)*

2.1.2. Increasing time availability

The increasing time availability is associated to an optimization and pooling of delivery time especially: Less time in transportation it is more time for other things. This increasing time availability appears as the second major interest to logistics collaboration identified by the interviewed farmers. 12 farmers out of 21 mentioned it spontaneously during the interviews and 17 choose it as one of the three main interests. This increasing time availability is identified at two different levels:

- Increasing time availability for production, because, as this orchard farmer explains,

> *"Improve the time to production is the daily preoccupation. The time spent in the car we don't spend it in the field" (Farmer 9, Interview 04 July 2014)*

More time to production to increase the quality or the quantity of the current production.

- Increasing time availability for other things,

"The time that you spent with your client you don't spend it with you children" (Farmer 1, Interview 18 June 2014)

As this vegetable farmer, mother of two children, numerous are the farmers questioning their working time and livability of their farming systems, especially vegetable farmers as talked about in the part 1, section 3.1.

It is interesting to notice that ¾ of the farmers chose this interest to have more time to production. However, the two farmers who mentioned this interest to have time for other things mentioned it with a recurrence ratio of 2.5 that is to say the highest recurrence ratio of the study (cf. table 14). This shows how important it is for these farmers to improve the livability of their systems.

2.1.3. Reducing logistics costs

"Less time on the road, less equipment wear: the benefits is above all economic" (Farmer 18, Interview 1st July 2014)

The third interest to logistics collaboration mentioned by farmers is the cost reduction. 12 farmers on 21 spontaneously mentioned this economical aspect during the interviews when 18 chose it as part as the three main interests to logistic collaboration. This logistics cost reduction is caused by a decreasing fuel costs, vehicle wear, working hours spent to logistics activities such as delivery or preparation.

It is important to notice the difference between the numbers of farmers spontaneously mentioning this economic aspect (8 on 21) and the number who choose it among the list (18 on 21) (cf. table 28). 10 more farmers mentioned it as part of the three main interests (multiple choices grid). This illustrates well the discredit the economical impact of the logistic organization among farmers. Logistic is not directly and spontaneously linked to an economical dimension as developed more in section 3.1 of the part 1.

2.1.4. Reducing Green House Gases (GHG) emission

"The coherence of the approach. We already had it said that short supply chains did not always have a better energy efficiency" (Farmer 17, Interview 19 June 2014)

This farmer's quote summarizes well this ecological aspect of collaboration. The ecological dimension of logistic collaboration is the fourth interests mentioned. 3 farmers on 21 mentioned it spontaneously when 7 choose it as one of the three main interests to logistic collaboration. This ecological aspect is associated to GHG emission reduction that a more optimized logistic leads to (travelled distance reduced and optimization of means of transportation mainly).

2.1.5. Increasing exchanges

The last interests mentioned was the increasing exchanges that collaboration can create. Developing communication and link between farmers lead most of the time to an increase of different forms of exchanges: information exchanges (technical, economic or ideas for example); service exchanges (mutual help between farmers who are part of a same project as more easily done) or products supplement, because as this vegetable farmer explains,

> *"Logistic collaboration leads to something really nice. It is: I have too much of that, and you, you don't have enough of that, we can get along" (Farmer 20, Interview 08 July 2014)*

However this interest is far from being the main one perceived to logistic collaboration. Only one farmer mentioned it spontaneously and two chose it as one of the main interests.

2.2. Logistics collaboration: obstacles to consider

Another important result for the reflection around logistics organization in the organic LFS is the obstacles inhibiting logistics collaboration as perceived by different interviewed actors. This part presents the necessary elements to understand these perceptions for farmers as well as other actors of the organic retail-wholesale sector.

Two aspects will be presented in this part:

- The obstacles to logistics collaboration in general, particularly based on the farmers interviews and span both vertical and horizontal forms of collaboration (content analysis and multiple choice grid analysis).

- The obstacles to vertical collaboration, focusing on the larger food system and the relationships between different actors and stakeholders (based on the content analysis of all the verbatim).

2.2.1. General obstacles

After analyzing the data collected and constructing the concept tree, eight categories of obstacles have been identified:

- Lack of confidence
- Singularity of each system
- Loss of human relations
- Cultural elements
- Loss of independence
- Isolation from other farmers
- Difficulty to find a fair system
- Lack of time to reflect on their organization

The analysis of the multiple choice grid shows the predominance of two main obstacles as illustrated in the pie chart (cf. figure 29): The lack of confidence (cf. section 2.2.1.2) for more details) and the singularity of each system (cf. section 2.2.1.1). By themselves they represent more than half of the “potential obstacles” for farmers.

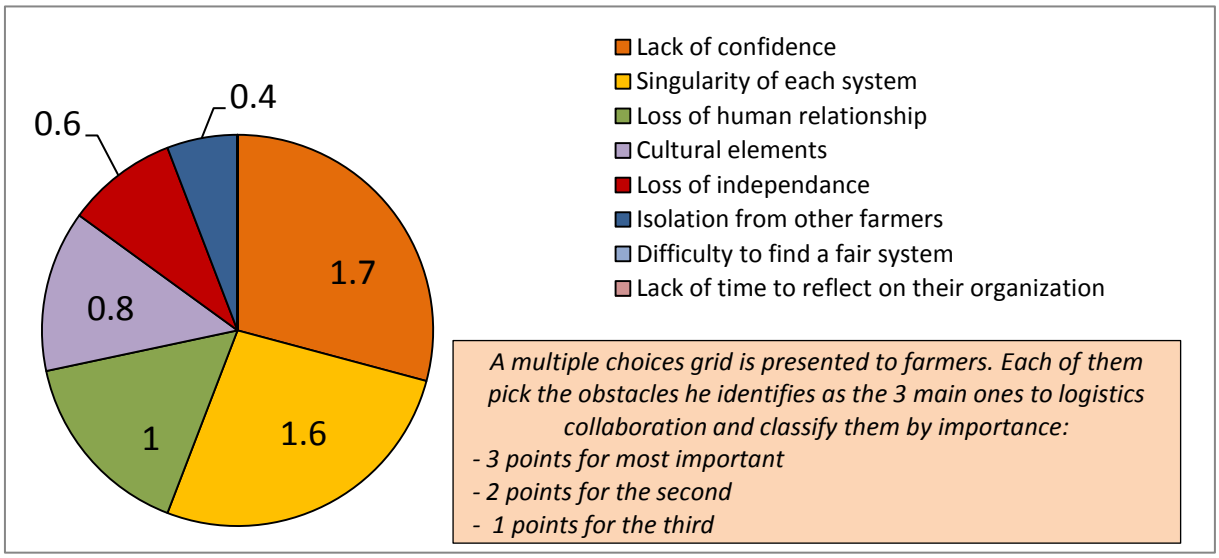


Figure 29 : Average points given by farmers to the different logistics collaboration obstacles
Source : Author, 2014

The obstacles associated with logistics collaboration in general are numerous and in varying categories (mainly human and technical). The following graph presents details on the importance of the different obstacles in a spontaneous reflection (content analysis) and a more guided reflection (multiple choice grid). It shows details on the different obstacle categories (clearer colors) (cf. figure 30). Further discussion on these results will be done later on in this section.

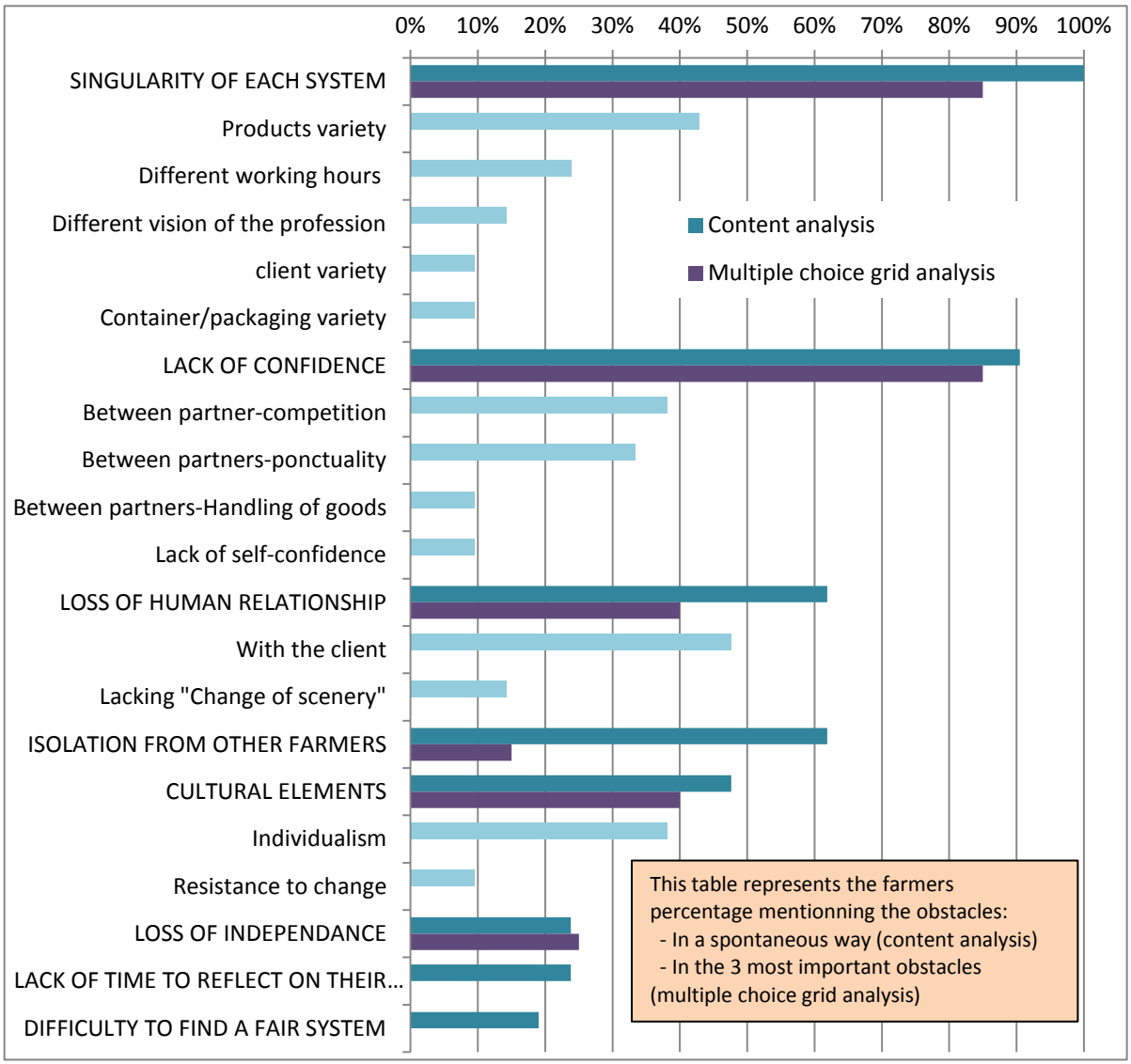


Figure 30: Logistics collaboration obstacles identified by farmers (Content and multiple choice grid analyses)
Source: Author, 2014

The following tables (cf. tables 15 and 16) gather the results of the farmer interviews analysis. The importance of each obstacle is highlighted:

- In their spontaneous reflection during the interview (number of farmers spontaneously mentioning the obstacle and the recurrence ratio for those who mentioned it)

- In a more guided reflection after presentation of the grid (number of farmer choosing the obstacle as part of the three major ones and number of points given to the obstacles in general (from 1 to 3, 1 being the most important).

This simplified table presents a quick visualization of the quantitative information that will be used in the detailed explanation following. The complete table can be found in the appendix (cf. appendix 10).

Table 15 : *Results of the descriptive analysis of the content analysis-Obstacles of logistics collaboration (Source: Author, 2014)*

CONTENT ANALYSIS						
THEME	**CATEGORY**	**CATEGORY SPECIFICS**		**Number of farmers mentioning the obstacle during the interview**		**Recurrence of this obstacle in the speech of the farmers having mentioning it**
Obstacle inhibiting logistics collaboration	Singularity of each system	Product variety		42%	**100%**	1.8
		Client variety		10%		1.0
		Container/Packaging variety		10%		1.0
		Different working hours		24%		1.4
		Different vision of the profession		14%		**2.3**
	Lack of confidence	Competition		38%	**90%**	1.4
		Low performances of the partners	Punctuality	33%		1.4
			Handling of the goods	10%		**2.5**
		Lack of self-confidence		10%		1.0
	Loss of human relationship	With the client		48%	**62%**	1.7
		Lacking "change of scenery"		14%		1.0
	Isolation from other farmers			**62%**		1.4
	Cultural elements	Resistance to change		10%	48%	1.0
		Individualism		38%		1.3
	Loss of independence			24%		**2**
	Lack of time to reflect on their organization			24%		1.6
	Difficulty to find a fair system			19%		1.0

Table 16 : *Results of the multiple choice grid analysis-Obstacles of logistics collaboration (Source: Author, 2014)*

MULTIPLE CHOICES GRID ANALYSIS			
THEME	**CATEGORY**	**Percentage of farmers who chose it as part of the 3 major obstacle**	**Average points associated to the obstacle (1 to 3 scale, 1 being the most important)**
Obstacles inhibiting logistics collaboration	Singularity of each system	**85%**	**1.6**
	Lack of confidence	**85%**	**1.7**
	Loss of human relationship	**40%**	1
	Isolation	15%	0.4
	Cultural elements	**40%**	0.8
	Loss of independence	25%	0.6
	Lack of time to reflect on their organization	0%	0
	Difficulty to find a fair system	0%	0

Now the obstacles will be explained in detail.

2.2.1.1. Singularity of each system

The singularity of each system appears as the main obstacle for farmers. All farmers mentioned it spontaneously during the interview and 18 of 21 positioned it as one of the three major obstacles for logistics collaboration (cf. table 15 and 16). Each farming system is singular: different products, different individuals, different marketing strategies and different logistics organization. This diversity can be seen as strength as seen in the previous section, as it increase the diversity of the offer increasing the access of new markets and the exchanges between farmers (cf. section 2.1.5 of this part) but can also make collaboration more difficult for numerous reasons:

- Variety of products: The variety of products can create some difficulties for collaboration such as:

  - *Refrigeration* for products that need different storage temperature (dairy products, meat for example), as this dairy farmer explains :

> *"Cheese […] requires refrigeration, and not everyone is equipped with refrigeration" (Farmer 16, Interview 24 June 2014)*

In her interview, Farmer 16 described this challenge when specifically addressing the topic of transporting goods collaboratively.

  - Current *laws and regulations* are also preventing farmer's from collaborating with one another

> *"Can we mix apples and vegetables? This is another question. We need the products that are compatible" (Farmer 4, Interview 25 June 2014)*

This compatibility needs to be present according to existing rules (for example the prohibition to mix meat and dairy products in the same fridge if not individually packed).

  - *Seasonality*

> *"The problem is that we do not sell to our clients all year long, there is a 2 to 3 month period when our goats don't give milk, therefore there is no delivery" (Farmer 15, Interview 23 June 2014)*

This goat farmer raises an issue. Some products have irregular availability throughout the year. It can then be more difficult to collaborate in the long run with them on deliveries.

- Client portfolio variety:

> *"The neighbors are not organic; we do not have the same clients" (Farmer 14, Interview 15 July 2014)*

Some farmers have very different and well defined distribution channels and sometimes they perceive this diversity as an obstacle to collaboration. However, it is important to notice that client variety has also been identified as an interest for logistics collaboration

because of the potential for accessing new markets through pooling (cf. section 2.1.1 of this part). This challenge therefore depends on the perception of the individual farmers.

- Container/Packaging variety:

> *"At the beginning his crates were in a standardized format so it matched well with our crates, and then, he changed and I could not manage to close the door of my truck" (Farmer15, Interview 23 June 2014)*

This testimony illustrates a fact: containers are a key element of logistics organization. Their diversity, shape or size can make collaboration difficult because of a lack of containers harmonization.

- Different vision of the profession: Farmers, are individual :

> *"We do not all have the same way to approach the profession and everything that comes with that" (Farmer 9, Interview 4 July 2014)*

Therefore farmers have different working hours and yearly rhythms. Through 'approaches of the profession' this farmer was referring to the way to manage the production in link with the different ways to manage an orchards, some choose to trust more natural processes (beneficial insects and natural environment for example) when others are more much active (pruning, choosing the varieties, treatment) and can see the other way to manage the orchard as passive, careless or lazy and that way being less inclined to collaborate with them. Although only 3 farmers mentioned this obstacle, the 2.3 recurrence ratio shows the omnipresence of this obstacle in the speech of the farmers mentioning it, often related to a negative collaborative experience.

2.2.1.2. Lack of confidence

19 farmers mentioned 'lack of confidence' as an obstacle spontaneously and almost the same amount positioned it as part of the three main ones for logistics collaboration (see tables 15 and 16). This lack of confidence can be seen at two levels:

- Lack of confidence between partners: Collaboration requires a certain confidence and trust between partners in order to succeed. This confidence is far from being spontaneous and easy, especially for farmers, and relates to two aspects.
    - *Competition*:

> *"Unveil where you go, [and] there is the aspect of competition. You go there and you steal one client. It is something that people don't say but it is what they think" (Farmer 18, Interview 1st July 2014)*

Mentioned spontaneously by 7 farmers on 21, this obstacle especially exists between farmers who have the same products as this farmer explains:

> *"I have a hard time believing that we can make [a successful collaboration between] two people with the same products […] there is something not sane about it" (Farmer 9, Interview 4 July 2014)*

- *Low performances of the partners*:

> *"When you are already late, ready to leave, and the other is not there yet because he is late, it puts back the entire schedule" (Farmer 17, Interview 19 June 2014)*

This obstacle is associated with the lack of punctuality from some stakeholders, but also inappropriate handling of the products, especially fragile products (leafy vegetables and yoghurt for example) because, as this farmer explains,

> *"It is trust; you entrust your products to someone. If the other stops in the sun for an hour, and it were salads, you can imagine?" (Farmer 1, Interview 18 June 2014)*

Even though this obstacle was only spontaneously mentioned by 2 farmers of the 21 interviewed, it was with a 2.5 recurrence ratio, the highest of the study. This shows the importance of this obstacle for the farmers who mentioned it. Here too, it is often linked to a bad experience of collaboration in their past as is the case for this vegetable farmer quoted above.

- Lack of self-confidence: As this organic shop manager explains,

> *"The relationship of trust is easier when you trust the product you send. Here too, it is farmers' psychology. If my carrot is perfect, I easily delegate, but if my carrot is not so great …" (Organic shop manager and farmer, Interview 9 July 2014)*

This organic shop manager explain through this quote the fact that some farmers prefer selling directly to the client because they think that they might have more chance to sell their products as the selection process would be less rigorous because of the direct human interaction with the client. That way a farmer who trusts her products collaborates more easily because she delegates more easily the act of sale.

2.2.1.3. Loss of human relationship

Loss of human relationship is mentioned spontaneously by 13 farmers of 21 but only 8 placed it in the top three major obstacles to logistic collaboration. This obstacle is associated with the delegation of the delivery resulting in a loss of contact with the client. Two approaches of this loss are seen:

- The loss of client relation

> *"For me the relation with the client is paramount […] In case of problems, if we explain them, the clients understand" (Farmer 14, Interview 15 July 2014)*

> *"The danger with subcontracting is the risk of losing the ability to intervene and react quickly. If there is a problem with the product, Dimitri, the driver, will refer it to Isabelle that will refer it to Alexandre, who will refer it to the administration council…it will be too late then" (Manager of a organic shop and farmer, Interview 9 July 2014)*

Explanations in case of problems, timely responses and possible interventions, are reasons why contact with the client is perceived as important for some, but also for identifying potential clients, because, as this farmer says,

> *"There is no one better than the farmer to sell his product" (Farmer 12, Interview 19 June 2014)*

- 'Change of scenery': As this farmer shares, for some,

> *"Delivering is nice, it enables me to see people from the cooperative or the shops, exchange, speak a little bit. If not, we keep to ourselves and we don't see anybody" (Farmer 4, Interview 25 June 2014)*

The loss of human relationship has also a more social dimension,

> *"The social link is vital; it pushes to see other things, to go out of the farm. It gives ideas" (Farmer 13, Interview 17 June 2014)*

Even if only 3 farmers of 21 mentioned it this way, it seems important to notice the need for social links and the willingness for some farmers to get away from the production environment and exchanges ideas, information, or quite simply, have a change of scenery.

2.2.1.4. Cultural elements

All farmers are imprints of a culture which influences their habits and ways of being and behaving. Some of these cultural elements also influence the development of logistics collaboration. 9 farmers interviewed of 21 spontaneously acknowledge the influence of their individual culture as an obstacle to logistics collaboration and almost as many place them as one of the three major obstacles to logistic collaboration. This obstacle has two main components:

- Individualism of the farming community actors because for some,

> *"Farmers work in a very individual way but not to say individualistic. As a result everyone does their own stuff" (Farmer 18, Interview 1st July 2014)*

More than a quarter on the interviewed farmers spontaneously mentioned this obstacle and link it as a characteristic of the farming community, as the culture of their region (Flanders especially).

- Resistance to change because as this goat farmer explains,

> *"As always, when you are used to work a certain way, you keep working that way" (Farmer15, Interview 23 June 2014)*

2.2.1.5. Isolation from other farmers

Isolation is an obstacle spontaneously mentioned by 13 farmers on 21, but only 3 of them situate it as part of the three major obstacles. The number of farmers in the countryside decreases every year. The number of organic farms has been divided by four in less than 50 years in France (Agence Bio 2013).This leaded to a higher isolation of each one of them making exchange more difficult. This isolation is even more present for organic farmers. In the Nord-Pas de Calais region the 275 organic farmers only represent 0.9% of the farming land area (cf. introduction) creating large spans of distance between them.

This distance can be an obstacle to the development of collaboration as this farmer shares:

> *"Here we are almost alone […] we are pretty limited. Try to find somebody with whom I could collaborate, but it is not crowed around here" (Farmer 7, Interview 18 June 2014)*

2.2.1.6. Loss of independence

> *"I would not put all my eggs in the same basket. You can easily be dumped [by someone you tried to collaborate with and depended on] from one day to another and then be in deep doo-doo" (Farmer 19, Interview 24 July 2014)*

The loss of independence has been listed among the main obstacles to logistics collaboration. This obstacle can be linked to the poor performances of partners of the rural individualistic culture. Working together can be coupled with 'going down together' in case of bad performances from one of the partners. Working together is accepting that you are not alone on the logistics chain and leave space for others when, as this farmer says,

> *"A farmer is very proud, because it is his product. It is your thing so you are very proud on the follow-up of your work. It is a little bit like an artist" (Farmer 12, Interview 19 June 2014)*

This loss of control on the logistics is a social obstacle to take into account in the construction of a more sustainable organic retail-wholesale food system in the region.

2.2.1.7. Lack of time to reflect on their organization

As Ison (2008) explains, it is important to understand the whole, to put things into context and establish their relationships between the parts of the system, in order to develop successful parts. There is balance to find between systemic thinking, based on understanding the interaction of the system, and systematic thinking which is more of a step by step thinking oriented on the parts of the system (Ison 2008).

However, as this farmer explains:

> *"We can't see the forest and the trees; we are too focused on doing our own things. We need someone to step back from the system and offer something new and then, we start to get interested. But we have too much work, too many things to sort out" (Farmer20, Interview 08 July 2014)*

He expressed the lack of time he has to reflect on his organization, and see it as an obstacle to see opportunities in the system that could help him organize better its logistics. This lack of perspective, partly due to the amount of time spent on logistics, is an obstacle for farmers to reach this systemic thinking and inhibits a better understanding of the food system they are in. They don't have the time to look for new information, information on the journey of each one of the neighbors that could help them to make sustainable and adequate decision in relation with their logistics through the development of new forms of organizing through collaboration.

Even though none of the farmers chose this obstacle as one of the three main one to logistics collaboration, 5 of them (of the 21 interviewed) mentioned it during the interviews.

2.2.1.8. Difficulty finding a fair system

> *"For me, the most difficult thing is to find a fair exchange" (Farmer 9, Interview 4 July 2014)*

The last obstacle has been mentioned by 4 farmers of 21 interviewed, and is often related to an experience of partnership, collaboration, most often informal relationship with they found unfair.

2.2.2. Vertical logistics collaboration obstacles

Forms of logistics collaboration can be horizontal, between farmers, but also vertical, between different stakeholders of the food system as seen in section 4.4 of part 1. Even though the previously identified obstacles for logistics collaboration are taken into account for the development of vertical collaboration, other more specific obstacles have been identified through the content analysis. This part summarizes these.

2.2.2.1. Low integration of logistics costs by the farmers

The disconnection between farmers and their logistics costs is a perceived as an obstacle to logistics collaboration. Most of the farmers interviewed were not aware of the costs that their logistics organizations demand. In this way they do not directly integrate the economic benefits of collaboration and show some reluctance to paying for a logistics service as these testimonies reflect:

> *"What needs to be explained to some members is that, yes, it is 10% of direct debit, but what is the time spent to sell a ton of potatoes, carrots in a shop? The 90€ that you give (for potatoes), you easily spent a couple of hours" (Cooperative chair member and farmer, Interview 9 July 2014)*

> *"I tax them up to 12%. But if [farmers] would have to go by themselves, it would be much more than that. They are not aware of that" (Manager of a transportation pooling initiative, Interview 25 July 2014)*

2.2.2.2. Difficulty to integrate the respective constraints between downstream and upstream

When we speak about logistics collaboration we speak about a relationship between multiple actors, multiple entities and individuals. In order to create a sustainable collaboration it is necessary to build relationships collectively and listen to one another. Integrating the constraints and restrictions of the others is one dimension of this listening. During interviews, the difficulty of integrating these constraints appeared under different forms.

- Selection process rigor: This has been mentioned by farmers but as well downstream actors. This refers to the control that verifies the conformity of the goods, either in compliance with a regulation or according to specific requirements and can many aspects from cosmetic appearance to sugar content. A lack of understanding of how this selection process is executed exists for some farmers who are then hesitant to work with an entity such as a cooperative and prefer to deliver directly to the client. The farmers see this direct link with the client not only as a way to limit the number of times their products go through the selection process but also because they feel knowing the client personally makes them more likely to take the product without question (a social quality addressed in detail in section 2.2.1.3 of this part). This organic shop manager summarizes the situation well:

> *"We need not to fall into the excess of the conventional selection process, but not [sacrifice quality either]. Norabio [organic cooperative] products have been refused at Biocoop [organic shop chain], even though those products have been accepted at the cooperative. And this because Biocoop knows very well that, because of the distribution chain, it is going to be sold no sooner than three days after being received from the platform. It is important to integrate the constraints from the other. The farmer complains because Norabio is too strict, but Norabio integrates the conditions. If not, farmers need to deliver directly, with the constraints that this creates" (Organic shop manager and farmer, Interview 9 July 2014)*

- Orders consistency: The need for orders consistency is even more important when the client is industrialized. For example, in institutional catering, there are performances to maintain in order to keep the costs low. This is why there is an importance for consistency in product quality and availability as the institutional catering manager explains:

> *"We are not many in the kitchen and there are performances to keep if we want to keep the costs stationary. If we do not have the products in time, it really put us in trouble. We need to have a peace of mind concerning our suppliers and this is super important in terms of consistency" (Institutional catering manager, Interview 23 July 2014)*

- Order-delivery period: The period between when the order is made and the delivery is important in the discussion between different LFS actors. Farmers want to have their order in advance as much as possible in order to have time to plan and prepare it. However, most of the clients want to give their orders at the latest time possible to gain flexibility. This creates a situation perceived as this one:

> *"They need to stop to placing their orders last minute. We bust our butt to deliver not to lose the client, but we are killing ourselves doing that" (Production and distribution platform manager, Interview 25 June 2014)*

- Free delivery value: Some establishments institute a free delivery value. This is the minimum amount of money needed per order to be delivered free of charge with minimal loss of profit. Coming from a logistics optimization strategy, this free delivery value is

sometimes perceived as disconnected from the reality of the stakeholders (Storage limitation, limited cash advance). This is what this restaurant manager explains:

> *"Norabio[organic cooperative] pushes me to work with them but they have a free delivery value up to 500 € on vegetables. This means that I need to order a lot for at least one and a half weeks. We need to be able to store this amount of vegetables […but] we cannot store 500 € of vegetables, it takes too much space in fridges" (Commercial catering manager, Interview 23 July 2014)*

- Need for flexibility:

> *"At the multimodal platform, it was this time or that time, and you absolutely need somebody when you go. You do not have access to the warehouse; it is them who bring you the products. It is very inflexible" (Commercial catering manager, Interview 23 July 2014)*

Some professions require some flexibility for their supply. That is the case for restaurants. This flexibility is not often included in the offers made to them.

2.2.2.3. Lack of collective vision in the long run

As shown in this study, this lack of communication leads to an absence of cooperation and that way an absence of real strategies at the food system level. Reasons for this lack of communication are numerous, from a diversity of visions and approaches to simply lack of stakeholder knowledge amongst themselves as previously discussed. However this work at the food system level seems essential to the collective construction of a sustainable and rationalized retail-wholesale organic food system. Working at the food system level leads to an integrated approach that is crucial to address the complexity of the food system and its interactions (Francis et al. 2003). Some actors recognize this lack of communication such as the local and organic products production and distribution platform manager interviewed:

> *"Demonstrate to one another that we can be complementary […] they didn't believe me that it was possible make two complementary systems work together […]the challenge is to make and understand that : Let's get interdependent[…]in order to develop efficient economic logistics" (Production and distribution platform manager, Interview 25 June 2014)*

This lack of food system level vision is also associated to the tendency to find short term solutions without going into depth with the problem, trying to find the root of it and then developing possible solutions as this board member of the organic cooperative of the region explains:

> *Once again, on the subjects we deal with at Norabio, when we have a small problem we give a small solution. No! We should take the problem and try to step back from it, looking at things in a global way (Cooperative board member, Interview 9 July 2014)*

These solutions might be more complex and harder to apply, but they are long term solutions. This stepping back usually brings wider reflection including different stakeholders of the food system.

2.2.2.4. Lack of planning between clients and farmers

One of the obstacles often mentioned by the actors from the food system is the lack of planning between clients and farmers. This obstacle is sometimes linked to a lack of willingness from farmers to fit to the demand or the retailers to fit to the offer. It is the point of view of this distributor of organic products:

> *"There is a lack of willingness to fit to the demand from farmers[…]Regional farmers are interested in processing only when they have surplus or are bothered with a size. It is not like that […] you need to match market demand" (Organic product distributor, Interview 28 July 2014)*

Some stakeholders of the retail-wholesale identify some disconnection between their needs and what is offered presently in the region. Such as this restaurant manager:

> *"In organic until now, it is you who needs to make the effort to look for your products. In supply, it is mainly that. It is a lack of centralization of the offer for commercial catering" (Commercial catering manager, Interview 23 July 2014)*

2.2.2.5. Consumers' education

Setting up vertical collaboration can be difficult because of the consumer/client education. Seasonality or aspects of the product are dimensions that can make cooperation difficult. Indeed,

> *"We need that people don't insist on ordering products that we do not have in stock, such as strawberries in winter for example" (Production and distribution platform manager, Interview 25 July 2014)*

The acknowledgment of seasonality by clients or consumers is not always there and therefore the demand can be in disconnection with the realities of production. It is the same for the aspects of the products for consumers that are too used to products from the vast selection of large retailers and supermarkets. This creates problems such as production waste as in nature; fruits and vegetables are growing in different shapes and size. There is work in communication necessary to suppress this obstacle:

> *"I think that shops in the Nord-Pas de Calais have interest to say that potatoes, if there is a little bit of black, or the carrot if it is a bit funny looking, it is nothing. But communicate about it: it is an excess of large retailers that lead you to think that way…We need to communicate" (Cooperative board member, Interview 9 July 2014)*

Through 'think that way'; this cooperative board member was referring to the consumers being used having products calibrated, from similar shapes and size, results of the rigorous selection process from large retailers and supermarkets.

2.3. Logistics collaboration: Potential strategies

In order to highlight the possible leverages to logistics collaboration, it is interesting to understand the forms that they can take. The content analysis as well as (personal reading or literature review?) led to the identification of some of them. This part reports this information.

2.3.1. Transportation pooling

The most natural solution coming to mind when thinking about logistics collaboration is transportation pooling meaning gathering to group some travels. Different approaches are considered.

- Informal mutual aid:

> *"She buys my tomatoes, my wife takes them when she goes to work, she meets her at the toll…we reached an agreement" (Farmer 21, Interview 17 June 2014)*

This form of collaboration is most used by farmers but often comes with problems, especially in relation to low performances of the partners (punctuality or inappropriate handling for example) or the feeling of unfair system.

- 'Travel exchanges' : Various farmers mentioned this idea:

> *"Some kind of a car-pooling: I have that amount of space in my car, every week I go here, there and there and go through this city and this place (Farmer 8, Interview 2nd July 2014)*

This idea comes from the "fodder exchange" already existing for the organic farmers of the region. The farmers having fodder to sell or willing to buy put their offer on a website organized by the Gabnor, the organization of organic farmers in the region. The idea is to offer the travel made, the frequency, space available on an internet platform that can then be linked with potentially interested people

- Collection: Pooling of travels can be done by a collection from the farms to put the products on common points (cooperative or platform for example).

> *"We need to start a collection service for farmers […] if we bring them this service they would be more inclined to drop some things such as delivering directly to shops, because it is in their interest to have it collected. They gain time and still keep the traceability of their products" (Cooperative board member and farmer 19, Interview 24 July 2014)*

- Delivery in order to pool travels to clients. The SCIC of transportation is a form of delivery pooling as explained more in the example interviewed (cf. focus on SCIC of transportation hereafter)

"I imagine a truck that would go, gather the farmers' supply, and then organize its own distribution route on farmers markets or shops" (Farmer 12, Interview 19 June 2014)

FOCUS ON…SCIC of transportation

Cooperative Society of Collective Interests for transportation

In a few words: This cooperative Society of Collective Interests for transportation includes 8 farmers who pooled a truck and a driver to do the deliveries. Each of them, and the driver brought a start-up capital to the SCIC, and 12% of the revenue made with the deliveries goes back to the SCIC to make it function.

Who is part of it: 8 farmers (2 are organic) from Boulonnais area.

Logistics collaboration implemented:

- Delivery pooling (truck and driver)

2.3.2. Products pooling

Logistics collaboration can also include pooling products. This enables farmers or other food system actors to create a coherent catalog bound to a specific type of client. This would open access to new markets that cannot be reached by an individual offer. For example:

- A CHR catalog bounds for Café, Hotel and Restaurant:

"We are forming a distributors pool with CHR axed catalog because CHR it is not the same organization as institutional catering. We have a common catalog where each of the 4 entities put their own items and then any CHR will be able to order to a single entity […] The objective is to have a coherent catalog, choices" (Commercial catering manager, Interview 25 July 2014)

This commercial catering manager is explaining the project that he started a year ago with three other actors from the food system, one distributor, two retail-wholesalers and him, responsible for the supply in his organic restaurant. They all had trouble obtaining local products to buy, especially processed products, and then decided to pool their products and clients. That way, when one of them found products or clients, he presents a catalog with the products of the three others. This catalog presents choices and diversity that fit to CHR demand.

- Institutional catering catalog:

"It is part of 'Terre d'Opale[6]', from the beginning, to gather the offering capacity to face demand and address new markets on which too many people hit a brick wall, for example institutional catering" (Production and distribution platform manager, Interview 25 July 2014)

[6] See Focus on Terre d'Opale p. 75 for more information

When speaking about people 'hitting the brick wall' because of institutional catering market, this manager vocalize a reality of institutional catering for many farmers. Nowadays, as local food still represents a small portion of the volume bought by institutions, the demand is often very irregular for farmers, in time and in volume. It is then difficult for farmers to organize an efficient logistics around it.

Moreover, institutional catering has very specific needs because of the volume needed and the industrialized aspect of production asked by rules as this institutional catering manager explains:

> *"In my profession, it is very important to have a single representative, being Norabio[7] or Spéninque or Fort & Vert. But somebody who collects offers, gathers it and does a single delivery" (Institutional catering manager, Interview 6 August 2014)*

This manager vocalizes the importance he sees in having few clients to buy from in order to facilitate logistics.

- A farmer catalog to meet the demand for products assortment because,

> *"Logistics collaboration leads to something really nice. It is: I have too much of that, and you, you don't have enough of that, we can get along" (Farmer 20, Interview 08 July 2014)*

This farmer expresses a very common phenomenon between farmers being farmers buying products from one another in order to extend the diversity of their offer when they sell directly to consumers (farmers' markets or on farm selling for example).

- Private individual catalog:

> *"I worked with farmers who had an online shop, 1200 clients, something like that. Some of the farmers would bring their products to one of them; they received the orders and delivered to everybody" (Farmer 8, Interview 2nd July 2014)*

2.3.3. Logistics equipments pooling

> *"I think that cooperation it is good for group purchasing and negotiating equipment: Refrigerated trailer, or refrigerated display case" (Farmer 17, Interview 19 June 2014)*

As this farmer vocalizes, logistics collaboration can also be on logistics organization equipment, especially for expensive ones such as refrigerated truck.

2.3.4. Concerted planning

Concerted planning has the objective of collectively planning production in order to overcome the individual constraints and meet client demand. This concerted planning can be done at different levels:

[7] See Focus on Norabio p. 76 for more information

- Within a *horizontal collaboration* between farmers in order to agree on the production of each of them depending on their capacity and will of each individual (technical knowledge, personal drive) and farms (soil characteristics and size for example). It is the case for these two interviewed farmers:

> *"We work together. He produces more in spring and I do more in fall. That way instead of offering small quantities of everything all the time, we plan together" (Farmer 20, Interview 8 July 2014)*

Terre d'Opale is a good example of horizontal collaboration (cf. focus on…Terre d'Opale for more information). Its manager is rooted in the principle that:

> *The farmer doesn't have the vocation to be the flunky of a bunch of consumers by trying, on his own, to offer all the possible vegetables that the consumer, in his desire of diversity, wants […] In Terre d'Opale[8] we work depending on the capacity of everyone […] It is in the interest of some to leave somebody else grow the radishes, or all the soils are not fitted for growing carrots" (Production and distribution platform manager, Interview 25 July 2014)*

FOCUS ON…Terre d'Opale

Production and distribution platform for organic and local product

In a few words: Terre d'Opale is a production and distribution platform for organic and local products. Production pooling enables farmers! to sell organic vegetables and fruits boxes in the area from Dunkerque to Boulogne in France as well as deliver to institutional catering.

Who is part of it: Various organic farms and 3 social gardens 'Graine de Cocagne' (rehabilitation entities through farming for people facing social exclusion)

Logistics collaboration implemented:

- Concerted planning between farmers on products to grow
- Product pooling
- Transportation pooling

- Within a *vertical collaboration* between farmers and other actors of the food system. This can help the production to be more closely meet the demand:

> *He made me some pâtés and ready-cooked dishes[…] with him, two times a year we work on the evolution, on consumer feedback on the products[…] I finally have a processor who is attentive to demand, we work together and we move forward"(Organic product distributor, Interview 28 July 2014)*

This distributor expressed the difficulty he had to find local farmers interested in working with him to meet demand and the importance it is for him, and for farmers to work together in order to meet the demand and that way securing the market.

[8] See Focus on Terre d'Opale for more information

"Today I manage to find supplies, but in the region there are not enough. There is maybe more upstream work to plan. I have needs during the year and I would be willing if they produced more […] if we could anticipate our volumes more, to contractualize our volumes, and invest in storage rooms, set up the necessary equipment. It is an investment but you can pool those. Me, carrots, potatoes, I could have one or two more months in the year" (Institutional catering manager, Interview 6 August 2014)

This manager vocalized the concept of concerted planning between the client and its need throughout the year and the farmer with his production capacity.

2.3.5. Common platform

Setting up a platform has been one of the first steps in the reflection of logistics rationalization in most of the industrial sectors as seen in section 4.3.2 of part 1 (Orsini 2008). This transit point, central or delocalized, where goods are held to be transferred to the point of delivery, leads to the rationalization the whole transportation chain and reduces the price of transportation. They can be of different kinds:

- Central platform, central place where products from multiple farmers are gathered before being redistributed to different selling points. Section 4.3.2 of part 1 already described this type of downstream pooling which is closest to the n°2 model (Orsini 2008). In the Nord-Pas de Calais region the cooperative Norabio[9] plays the part of this platform.

FOCUS ON…Norabio

Cooperative 100% organic Nord-Pas de Calais

In a few words: Created in 2000, Norabio is the only 100% organic cooperative in the region Nord-Pas de Calais. It has for objective to sell the regional organic products and organize the marketing of organic products in order to help farmers to keep control of the marketing negotiation.

Who is part of it: 129 organic farmers in total, 57 for the marketing of their products and the others for supply pooling.

Logistics collaboration implemented:

- Farmers' supply pooling (seeds, seedlings, fertilizers and other supplies)
- Product pooling (Creation of different catalogs: catalog wholesale, retail-wholesale, and private individual boxes).
- Marketing activities pooling (Order anticipation and management pooled)
- Delivery pooling (1 driver and 1 refrigerated truck)

[9] See Focus on Norabio for more information

- Decentralized platform, functioning as warehouses for multiple farmers as described in the model n°3 of logistics organization (cf. section 4.3.3 of part 1). Several farmers gather their flows at a multi-farmer warehouse before sending the goods to the distributer. The reason for this is because individually, producers do not have the volume necessary to supply the central platform with the wanted frequency. This is called 'upstream pooling'. The idea is present among some stakeholders:

> *"I think that the idea of decentralized platform would be good. It could make Norabio more visible and say, yes, we are a local cooperative and we are not only in Gondecourt" (Cooperative board member and farmer 19, Interview 24 July 2014)*

> *"I think it would be interesting to have local platforms that have an influence in their area and that work with the cooperative" (Production and distribution platform manager, Interview 25 July 2014)*

- Dematerialized platform can also function as downstream or upstream pooling but through an online tool to facilitate collaboration between farmers because,

> *"In the organic world, we miss out on all the web experiences […] dematerialized platform for the Avesnois farmers, it could be pretty interesting. Then it could be a truck that goes to Lille once a week to deliver." (Farmer 12, Interview 19 June 2014)*

This could be done in the form of a product pooling from different farmers on a same internet platform, accessible to potential clients as this platform manager imagines it:

> *"Post the fruits of his farm to a computer that will send it to the 'cloud' to say to a certain number of partners, 'I have this to offer'. These offers are storable, buyable and geo-localized. That way, every time that you take your truck, your know that it will not come back empty" (Production and distribution platform manager, Interview 25 July 2014)*

The second section of this part highlighted that even though a lot of interests are linked to logistics collaboration, numerous are the obstacles that make it difficult to implement collaboration. However, the last part showed the great variety of logistics collaboration strategies possible. It is then important to find the form(s) of collaboration the most appropriate to the situation.

PART 4: PROPOSITIONS AND CONCLUSION

This study has evaluated the economic, ecological and social performances of the current situation surrounding the organic local food system (LFS) of the retail-wholesale sector in Nord-Pas de Calais. This thesis has thus far highlighted the margins of progress which are sometimes necessary to develop a sustainable LFS. Collaboration has been studied as one of the potential leverage items for improving the economic, ecological and social performances through identifying collaborative interests and potential forms collaboration can take. However, obstacles to logistics collaboration have also been identified.

It is important to go beyond these first results to suggest recommendations. Linking the main ideas from the field and the context into which they fit is a key step for moving toward action.

This section will start with an evaluation of the potential of evolution in Nord-Pas de Calais to then move toward the development of some propositions to help move toward action and suggestions for further research. This section finishes with limitations of the study.

1. Evaluating the potential of evolution in Nord-Pas de Calais

This section evaluates the potential of evolution in Nord-Pas de Calais and reviews the most important elements to take into account in this process of moving toward concrete action. It highlights the strengths and weaknesses of the current situation along with the opportunities and difficulties perceived to move toward the wanted situation (cf. part 2, section 4.1 for more information on the methodology). The wanted situation is, for this study, a collaborative form of logistics organization at the LFS level as has been highlighted in the farmer and stakeholder interviews in the previous chapter.

This diagnosis guides reflection on recommendations that will help make the current situation evolve toward the wanted situation. Suggestions rely on the opportunities identified while building on the current situation's strengths while limiting its weaknesses. Suggestions also take into account the obstacles identified in order to find adequate solutions.

In this study the current situation is the individualized logistics organization of the organic farmers for retail-wholesale distribution channels meaning an organization with little vertical or horizontal collaboration between stakeholders. The wanted situation, on the contrary, is a local organic food system with a collaborative organization leading to a situation economically profitable, ecologically sustainable and socially livable.

- *Economically profitable* because, as seen in the section 1.2 of part 3, the economic performances of farmers logistics organization can be very low. It is important for the food system to be sustainable in the long term, and that the hours of work done are paid, at least up to the French minimum wage, to not endanger the survival of farms.
- *Ecologically sustainable* because today GHG emissions are at the center of reflection and it is important that everyone limits their emissions. This is also consistent with the fundamental principles of organic farming being to aim for a healthy product and the development of an ecological and social balanced system on their farm (preserving soil and water quality, reconnecting with the consumers mainly) discussed in section 1.1 of part 1.
- *Socially livable* because distribution of working hours on the farms and amount of time dedicated to logistics are important parts of the matter discussed by farmers currently. These dimensions are connected to the challenge of achieving a certain degree of livability with current farming systems, especially for vegetable farmers (cf. section 1.4 of the third section).

Table 17 : Evaluation of the potential of evolution - Toward a collaborative logistics in the Nord-Pas de Calais organic LFS for the retail-wholesale sector

TOWARD A COLLABORATIVE LOGISTICS ORGANIZATION Retail-wholesale sector in the Nord-Pas de Calais organic local food system		
Individual retail-wholesale **Current dominant situation** *Little vertical or horizontal collaboration*	**STRENGTHS** • Strong link with the client • Flexibility and independence	**WEAKNESSES** • Discredit of logistics by farmers - High logistics costs in a context of increasing fossil energy cost. - High working hours allocated to logistics tasks - High environmental costs
Collaborative retail-wholesale **Wanted situation** - *Economically profitable* - *Ecologically sustainable* - *Socially livable*	**OPPORTUNITIES** • Increasing amount of farmers questioning their logistics • Perceived interest to logistics collaboration by key actors of the food system (*Increasing time availability, accessing new markets, decreasing logistics costs*) • Existing involved stakeholders, "champions" having a holistic vision of organic food system development. • Existing success stories of rationalized logistics organization in the region	**THREATS** • Singularity of each system limiting transportation pooling between farmers • Isolation, geographic remoteness of farmers • Potential loss of human relationship • Lack of confidence between farmers (*competition, punctuality*) • Individualistic culture • Necessity to take the time to reflect to build a long term vision • Difficulty to integrate the respective constraints between downstream and upstream • Lack of planning between clients and farmers

The results of this diagnosis are gathered into a matrix in the table 17, as explained in the methodology (cf. section 4.1 of the second part). The matrix is explained in the first part of the section.

The dominant current situation, individual retail-wholesale with little vertical or horizontal collaboration, have strengths but also weaknesses.

1 Strengths of the current situation -Individual logistics organization

Two main strengths are associated with the individual logistics organization:

- **Strong contact with the client** is possible due to the individual organization of the marketing channel creating direct and regular contact with the client during delivery

and order organization. This strong link is associated to numerous benefits such as quick reaction in case of problems, canvassing other products or simply providing a social link, getting out of the farm, seeing different people and being in contact with new ideas or information.

- The individual logistics organization also brings **independence** and **flexibility**. Working individually leads to more freedom in the choices made or the decisions taken. This brings a certain rapidity of action through a real control of the logistics tools which can be difficult in a collaborative scheme.

2 Weaknesses of the current situation-Individual logistics organization

The weaknesses of the current situation are the main reasons that this study commenced. Indeed, LFS have been questioned on their economic, social and ecological performances (cf. section 3 of part 1). The individual organization of farmers leads to a poor rationalization of the distribution channels and logistics. This leads to:

- **High logistics costs** with 23% of the revenue corresponding to logistics on average reaching 34% for the vegetable farmers interviewed (cf. section 1.2 of part 3).

- **High working hours** dedicated to logistics, especially in the retail-wholesale because of the characteristics of this distribution channel (little volume of varied products to numerous delivery points) (cf. section 1.4 of part 3). It is on average 12h30 per week dedicated to logistics for the interviewed farmers going up to 35h30. These numbers illustrate the need to develop systems that are livable for the farmers involved in them (cf. section 1.4 of part 3).

- And finally the **ecological costs** of individual logistics organization with low rationalization are **high**. Ecological impacts of LFS are more and more discussed among the academic sphere (cf. section 1.3 of part 3). The study shows that the average energy intensity is 9.2 kg of CO_2 for 100 € of revenue that is to say a average of 3.3 tons of emitted CO_2 per year due to the logistics organization of the retail-wholesale distribution channel.

These economic, social and ecological results could be improved by a better logistics rationalization. That can be done through an increasing collaboration between the food system actors. This is the studied scenario for the wanted situation. It is now important to highlight the opportunities that can help and obstacles that can hinder the development of the wanted situation; this collaborative retail-wholesale distribution channels for organic farmers in the studied area, the Nord-Pas de Calais.

3 The opportunities for an evolution toward the wanted situation

Opportunities are the elements on which it is possible to rely to make the current situation evolve toward the wanted situation. At the individual *farmers' system level*, two opportunities stand out. The first is one of the reasons this study was requested by Gabnor. It corresponds with the **questioning of some farmers on their logistics organization**. For the past two years, reflections about logistics organization and its optimization have been brought up by farmers and discussed during meetings and workshops organized by the organization of organic farmers in the region, Gabnor (as seen in the presentation of the case study area in the introduction). This study presents an opportunities by reflecting upon these questions and can help farmers to realize possible ways to reach solutions; for example evaluating logistics organization performances.

A second opportunity has been highlighted by this study. As seen in the section 2.1 of the results, **farmers have interest in logistics collaboration**. The perceived interests identified previously allow an understanding of the farmers' expectations and concerns among one another and that way adapt the dialogue when introducing new projects of logistics collaboration appropriately.

At the *food system level*, for the local organic food system for retail-wholesale in the area of research, the presence of actors having a holistic vision of the development of organic farming are an important opportunity situation evolution. Indeed, these people often are those that initiate, inspire or lead innovative initiatives locally. These '**champions**', as defined by J. Bagdonis et al. ((Bagdonis et al. 2008), play a major role, not only at an operational level but as well for implementing projects. Indeed, these champions bring energy, motivation, passion and commitment. Their network and their resources are keys to enhancing change and evolution. They can be the link between different stakeholders by maintaining the energy and the enthusiasm in a process of evolution and implementation of innovative collaborative system for logistics organization. These 'champions' are present at different level of the food system. Some are farmers, often representatives in farmers organization (such as the organic farmer's organization Gabnor or the organic cooperative Norabio), others are active in other parts of the LFS such as organic shop owners or institutional catering managers.

The identified 'champions' are often linked to an **example of collaborative logistics in the region**. These examples are a source of inspiration. Indeed, a better understanding of their current functioning, their history and evolution and the difficulties they came across is a good basis for reflection. It is important to rely on what exists in order to integrate their potential in a scheme of action. The cooperative Norabio is the main example of logistics

collaboration in the region. It is a tool with a major potential as it already gathers 129 farmers and has a sphere of influence at the regional level (see Focus on…Norabio 76). The production and distribution platform Terre d'Opale is another example of a tool to take into account in the reflection around logistics organization at the regional level because it is innovative on elements such as concerted planning for example. (cf. Focus on…Terre d'Opale p 75). Other examples exist such as farmer's shops (product pooling), SCIC of transport is an example of transport pooling (cf. Focus on…SCIC of transport p. 73) and distributor pool (product and marketing pooling). An understanding of these examples can add constructive elements to a broader reflection at the food system level.

The differences depending on the region infer different 'champions' and initiatives. There is no one solution that can be applied everywhere, but a rather the interaction between the existing strengths and opportunities of the current local food system and the wanted situation chosen.

4 Threats preventing evolution of situation toward the wanted situation

The identified threats are a summary of the obstacles identified in the results and discussion of the qualitative analysis (cf. section 4.1 of the part 2 for more information on the methodology).

Technical obstacles can inhibit logistics collaboration. These technical obstacles can be caused by the *singularity of individual farming systems*, and are linked to the variety of products (different seasonality, refrigeration material necessary and current laws and regulations), variety of containers/packaging, or working hours (cf. section 2.2.1.1 of the results and discussion). This obstacle is recognized by all the interviewed farmers as a limiting factor for collaboration, especially for transportation pooling between farmers (cf. section 2.2.1.1 of the results and discussion). Another technical obstacle is the *isolation from other farmers*, the geographic distance between them (cf. section 2.2.1.5 of the results).

The **obstacles** can also be **human** such as the *fear for a loss of direct relationship with client* mentioned by half of the interviewed farmers, direct relationship present in the current situation of individual organization mentioned in the strengths of the situation (cf. section 2.2.1.3 of the results). *The lack of confidence among farmers* is another human obstacle for logistics collaboration mentioned by up to 90% of the interviewed farmers (cf. section 2.2.1.2 of the results). This lack of confidence between partners is mainly due to lack of punctuality or bad handling of goods. Finally the *individualist culture* is perceived

as an obstacle for 40% of the farmers and mentioned by other LFS actors (cf. section 2.2.1.4 of the results).

Other obstacles have been highlighted such as the *necessity to reflect on the current situation* in order to enable a long term vision; *the difficulty to integrate the respective constraints between downstream and upstream* and *the lack of planning between clients and farmers* (cf. section 2.2.2 of the results).

This diagnostic summarizes the current situation in the studied region regarding the strategic vision of an evolution toward a more collaborative system economically profitable, ecologically sustainable and socially livable as defined earlier in this section (cf. p. 80). What recommendations can be made from this diagnosis to initiate the evolution of the reflection toward action? This is the content of the next part of this section.

2. Recommendations for action

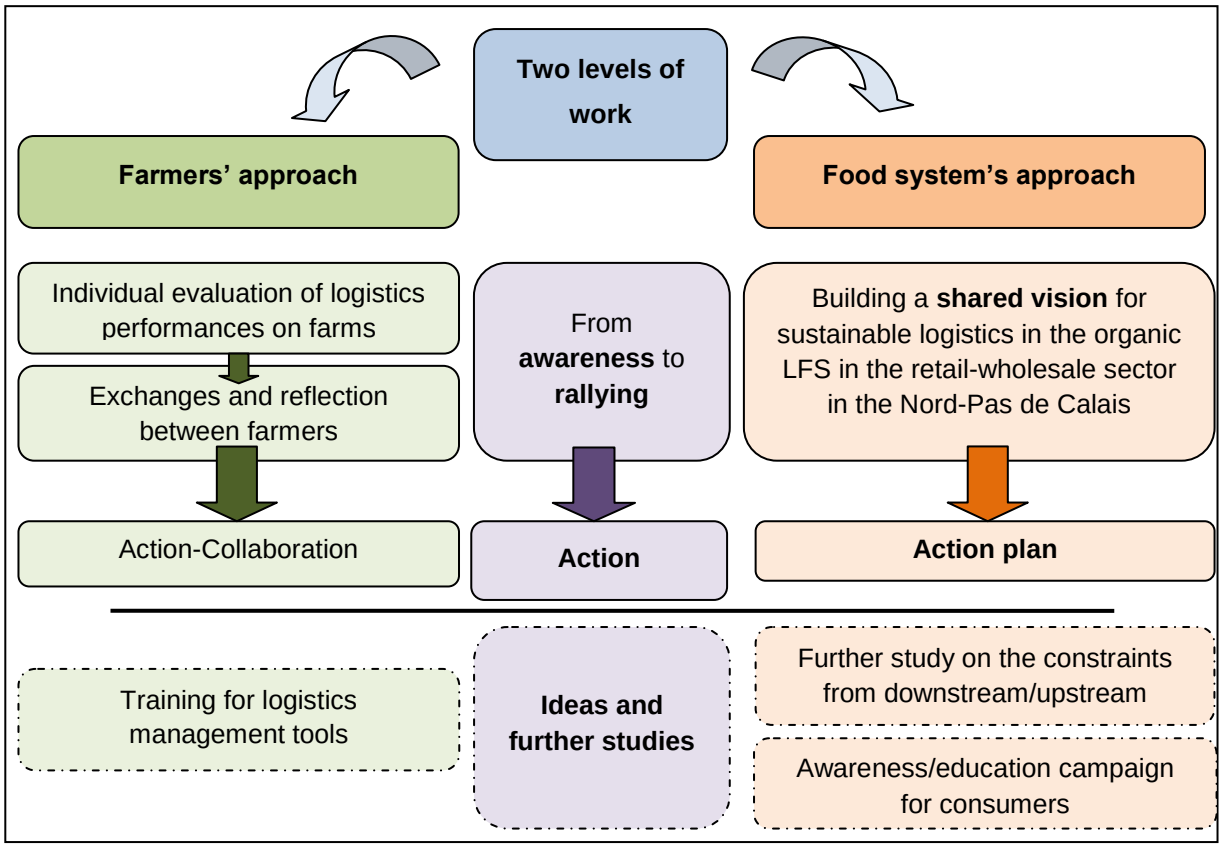
The development of a collaborative and rationalized logistics can only be done at the food system level through cooperation between the various food system actors as a systemic thinking is necessary to understand the interactions and practices of the current situation to move toward a wanted situation (Ison 2008). However farmers remain key actors of the LFS and it is through their choice of marketing channels and logistics that a larger scheme of collaborative logistics can emerge. Working at the farmers' 'level is necessary in parallel to working at the food system level.

In this way, the diagnosis highlights two levels of action:

- 1) Work at the **farmer's level** in the region
- 2) Work at the **LFS level** in the region

For each level of action, recommendations are suggested in response to the diagnosis of evolution potential made previously. For each of these approaches, a main idea is expressed and explained, followed by ideas for action or further studies.

5 Farmers' approach



Farmers are the main actors of the organic LFS. It has been shown in the results that most of the farm not aware of the impact of their logistics on the economy of their farm or their working time (cf. section 2.2.2.1 of the results). In order to start a reflection on logistics organization at the food system level for the organic retail-wholesale sector and before speaking about rationalization and logistic collaboration, it is important to increase the farmers' knowledge and awareness on these topics.

5.1 Individual diagnostic on logistics performances

The disconnection between farmers and their logistics costs has been highlighted previously (cf. section 2.2.2.1 of the results). Time spent on logistics and the associated costs are often neglected and excluded from the general farm strategy. Farmers questioning their logistics organization are an identified opportunity to move toward a more collaborative organization.

Giving farmers elements, individually, about the performance of their logistics, is a key step to initiate reflection on their marketing strategy and the impact of their logistics. Helping them evaluate the social, economic and ecological performances of their logistics at the farm level, can initiate a more global reflection at the food system level as it will help them perceive the multidimensional aspect of their logistics, help them grasp the interconnectedness between the parts, the subsystem as Armson (2011) call them, and understand the impact that change in a subsystem or its relationship to other subsystems, at the farm level, can have in the system as a whole, the LFS in the region (Armson 2011). This study brings a framework to this diagnostic as it led to the identification of key indicators and a method to calculate them (cf. section 2.1 of the materials and methods). From the indicators used in this study, it is possible to build an individual diagnostic of logistics performances. This diagnosis brings a social, economic and ecological dimension in order to bring farmers' attention to the multidimensional impact of their logistics. This diagnostic can be completed at different levels on the farm and it can be helpful to compare, on a same farm, the different modalities or delivery routes depending on the accessible data, to compare their efficiency and profitability and then be able to orient choices and marketing strategies. An organization such as Gabnor, regional organic farmers' organization, could facilitate this process of increasing farmers' awareness. Appendix 11 highlights an example of diagnosis that has been done for an interviewed farmer (cf. appendix 11).

Organize an exchange between farmers around the results of these individual performances is important to initiate a collective reflection. The reflection should be guided in a way to identify the reasons leading to differences between farmers, to highlight the elements that make an efficient system, thinking about the strengths of efficient organization and emphasize ideas and sources of inspiration to stimulate the reflection of each farmer. The discussion can be canalized to different genres of organization depending on the need: planning, preparation, and delivery, order management or collaboration, for example. As has been seen in the previous section, the results of the diagnostic vary greatly depending on the product. Different products have different logistics characteristics. The singularity of each system can make the comparison of the logistics strategies performances difficult. This is why it is important to compare systems that are more or less equivalent. For that reason it could be constructive to organize the exchange between farmers through groups of the same category of products.

5.2 Training for logistics management tool

As highlighted throughout this study, logistics organization is not limited to the only organization of delivery. As seen in the results, 23% of the time dedicated to logistics is for planning, from taking the order to invoicing. It represents 14% of the logistics costs. It is important for farmers to gain knowledge about how to optimize this part of the logistics. Training farmers to use a logistics management tool can be a starting point to enable farmers to compare the different selling points, to follow the details of the sales, the revenue, and the volume of products associated or the regularity of the orders for example. Knowing these information can help to make decisions and formulate logistics strategies in the future.

Few are the farmers using computer tools to follow their deliveries and orders. It is only 5 farmers of 18 interviewed who have a computerized data. Another way to increase farmers knowledge about logistics is to train them to use software for logistics management which can be an Excel tool (or Open office for a free software), or more sophisticated software depending on the expectations of farmers, their involvement and the how they plan to use the data. This type of training can be especially relevant for dairy farmers having planning costs more important than the others due to a high number of selling points and that way have a more complex logistics to follow orders and sales.

6 Food system approach

Even if the work at the farmers' level is necessary to increase their knowledge about logistics, it is only efficient if correlated with a more holistic reflection at the food system level (Francis et al. 2003). This study shows that logistic costs are underestimated and that farmers often 'offer' this service to their client, either because it has always been that way or because they are afraid of losing their clients. To involve various actors of the LFS in the reflection, from farmers to consumers can lead to a better understanding of the realities of everyone. Building a collective vision can be a way to involve and gather the actors of the organic LFS in a project of developing a sustainable logistics as will be explore in the following section.

6.1 Building a shared vision

Numerous are the key stakeholders and projects identified in the organic LFS for retail-wholesale sector in the Nord-Pas de Calais region. However, communication linkages are missing. One of the identified obstacles inhibiting logistics collaboration is the lack of reflection to realize a long-term vision. This obstacle has been mentioned by five interviewees. How to create the link between these initiatives, these actors, and these

projects? How can the awareness and involvement of stakeholders of the LFS be facilitated? Building a collective vision in the long run on the theme of developing sustainable logistics in the retail-wholesale sector of the organic LFS in Nord-Pas de Calais can be a suggestion.

> *"If a person is dreaming, it is just a dream; but if several people dream together, it is the beginning of something new" Brazilian*
>
> *"If you want to build a ship, don't content yourself with gathering the men, the wood and the steel, but tell them about the seas the vessel will sail to and fro to make them dream about it" Antoine de St-Exupéry*

A visioning process can be described as a way or tool to move out of a "messy situation" towards a future wanted situation. It can be difficult to create a consensus because of conflicting interests and different world views (Checkland & Poulter 2006)**.** Visioning is a method that enables the stakeholders to move away from these constraints and review the challenges as possibilities, where current limitations do not suppress ideas and inspirations. In Marjory Parker's book *Creating Shared Visions*, a vision is about getting inner experience of a future wished situation, which are so clear and concrete that we can feel them if they are realized. When visioning, the idea is not to rush into action planning but first take time to think about where we want to go in the long term, regardless of the potential hindrances, and then to think about the best way to get there (Parker 1990).

A very valuable start point to a visioning session is a 'Brain-stilling exercise', which has the purpose of opening up the minds of the participants, and clearing out perceptions of the current problems and worries. This is done in a form of a relaxation, or meditation where participants close their eyes and clear their minds. Brain-stilling is followed by an introduction to the visioning session – bringing the participants to the future, which the participants then describe from their open mind. A good way to guide participants in their visioning work is to end the introduction with open questions to help participants structure their thoughts and ideas. Finally, the participative building of the vision takes place, based on exchange about the vision of each one. It is during this phase that convergences and conflicts appear (Parker 1990).

This exercise enables participants to imagine a global solution for the wanted situation instead of limiting themselves to problem solving. Problem solving is centered on difficulties and usually results in addressing each problem individually without having a holistic approach. By creating space for ideas and visions to emerge, you enable people to contemplate what they truly want to see in the future and to express ideas that they

may not allow themselves to develop because of the predetermined limitations often imposed by society (Parker 1990).

Once the objectives are defined and agreed upon through the shared vision, the stakeholders can think about the first steps to reach the vision depending on the current situation. For this research, these actions take into account the current situation, summarized in the potential of evolution diagnosis in the previous part (cf. section 1 of this last part). They rely on the identified opportunities and take into consideration the obstacles to bring actions that have the best chance to lead to positive and constructive results. It is important to have regular time for exchanges among the stakeholders of the LFS throughout the years, to evaluate the evolution of the situation, discuss the challenges found, the successes, and remembers the shared objective and vision.

6.2 Further studies on downstream and upstream respective constraints

Another action possible at the food system level is to do further studies on downstream and upstream respective constraints in order to facilitate vertical collaboration between different actor of the food system. The difficulty to integrate constraints between downstream and upstream is an obstacle to logistics collaboration, especially to collaboration in time, through a sustainable and cordial relationship between farmers and clients. Within every aspect of the logistics chain, selection process rigor, order-delivery period, need for flexibility or consistency, free delivery value, etc. are all examples where every actor of the food system has specific constraints. In order to maximize vertical collaboration it is important to minimize these constraints.

Further study could be done on identifying the constraints of the downstream and upstream actors, explaining the reasons these constraints exist and identifying possible forms of collaboration/ organization overcoming these constraints and highlighting conditions under which collaboration can be sustainably established. It could be constructive to gather representatives of farmers (including representatives of different products to demonstrate varying constraints) and clients (varying depending on the nature of the modality).

6.3 Education/awareness campaign for consumers

Consumer education is an obstacle that appears through the “difficulty to integrate the respective constraints from downstream and upstream”. Six of the interviewees of this study mentioned consumers’ consumption preferences as an obstacle to the implementation of vertical logistics collaboration (cf. section 2.2.2.5 of the results).

Consumer demand is often disconnected from the local reality of production because they are not in sync with the seasonality of the products offered. Moreover consumers are used to standardized products coming from the drastic selection process of the supermarkets and major retail-wholesalers which leads to a significant refusal rate and waste of food. This problem is especially present in shops where there is often no direct link between the farmer and its products.

It is important to involve all the parties of the food system in order to handle the complexity of change, to 'close the loop' (p. 112). Consumers are not always involved in the matter of changing the food system, and don't always make the connection between their food, agriculture and the environment they live in (Francis et al. 2003).

Communication on this topic in shops is an important part of changing consumers' consumption habits. Informing on seasonality and aspects of products, popularizing explication on what led to the standardization of products, advertizing the diversity of shapes and size are example of actions that could be done to that purpose, or communicating on taste and originality. Existing campaigns already exist on local and seasonal food such as the campaign "Organic and local, it's the ideal" started in September 2014, by the FNAB, the national federation for organic farmers in France. However, not many exist on the aspects and issues surrounding the standardization of products and waste.

It is through constant and varied work with consumers that they can be deconditioned from the system in which they have always evolved to build new references and lead, finally, to a relaxing of the selection process and decrease food waste.

3. Limitation of the study

The major limits of this study are linked to the quantitative analysis necessary for the evaluation of logistics performances. Indeed, farming being an activity which is seasonal, it is difficult to estimate data such as average revenue delivered every week or travel distance per week as it can vary greatly from month to month or year to year. To try to be as precise as possible volumes and kilometers have been estimated per year to then be brought back to weekly frequencies. It could be more precise to do this evaluation of logistics performances on a longer run with a sample of chosen farmers in order to gather more precise data.

Data on volume or weight of products were in the questionnaire to gather ecological indicators not independent on from the economic factor (revenue) and be able to compare systems of different products. However, the data collection phase showed its limits.

Seasonality and great variation from week to week made it too complex to gather that information in the frame of this study with the time allotted.

Moreover, as no literature exists about logistics performances of organic LFS for the retail-wholesale sector, the absence of existing references prevented comparison and integration of the results in a broader scheme. This study was interested to highlight the differences between the different productions. It would be now interesting to focus a study on specific products such as vegetables or dairy products, for example, in order to gather enough data to find correlations between logistics performances and marketing strategies. It would be as well helpful to study in more details the existing projects of logistics collaboration in the studied area, highlighting their challenges and strengths and analyzing their evolution in time within the food system.

This study is a broad study, building a base, a reference for further studies.

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Appendices

Appendix 1: Expert Interviews - Details on the experts

Affiliation of the interviewee	Field of Expertise	Projects similar to the study
Researcher at IFSTTAR (French Institute of the Transportation, Planning and Network Sciences and Technology)	Short supply chains logistic organization	- PhD thesis on "The logistic organization performances of local food system" (2013) - Study in process on logistic alternative for short supply chains in Nord Pas de Calais (2014-2016)
Researcher in the organization "Virage Energie Nord-Pas de Calais"	Energy transition- Food energy costs	- Study on energy sobriety including a 'food' scenario with an section on localizing the food system (2013) - Study in process about the assessment of energy content of local meals (2014)
Researcher/Professor in logistic management at Lille University 3.	Transportation and logistics management	Head of his department and interested in the rural problematic around logistics and transportation.
Project manager on the organic sector organization in Gabnor (Nord Pas de Calais organic farmers organization)	Organization of the organic sector in the region	Work to structure the organic sector and develop distribution channels for organic products.
FNAB (National Federation of Organic Agriculture)	Organic sector localization	Study in process on localizing the organic fruits and vegetables
"Saveurs et saisons" manager	Logistic management	Manager of an organic bakery and organic shop specifically concerned with logistic matters
Project manager of "Livicote"	Transportation and logistics management	Project of mobility service associating carpooling and car-sharing between individuals on rallying points

Appendix 2 : Details for the calculation of the chosen indicators

INDICATORS	CALCULATION	UNIT		Economic	Social	Ecologica l
Delivery distance for retail-wholesale	$\sum Travelled\ distance\ \ per\ delivery\ route$	Km/week	Appreciates the distance travelled per farmers in average and enable the calculation of a variety of economic, ecological and social indicators.	X	X	X
Revenue for retail-wholesale	$\frac{Retail-wholesale\ revenue}{Total\ revenue}$	%	Enables to appreciate the importance of the retail-wholesale outlets in the marketing strategy of the farm.	X		
Weekly revenue for retail-wholesale	$\frac{Yearly\ retail-wholesale\ revenue}{52\ (nb\ week\ per\ year)}$	€/week	Enables to calculate other economic indicators.	X		
Weekly fuel consumption for retail-wholesale deliveries	*Travelled distance for the retail-wholesale selling points (km/week) * Average consumption of the used vehicle (l/km)*	l/week	Enables to calculate economic and ecological indicators.	X		X
Time spent on planning	*Estimation from farmers*	h/week	Enables a social approach of the logistic organization linked with the repartition of working time (planning, preparation and delivery) among farmers and the time spent for logistics.		X	
Time spent on preparation						
Time spent on delivery						
Time on logistics						
Fuel costs	*Weekly fuel consumption (l/week)* Cost of the used fuel (€/l)*	€/week	Enables an economic approach in details of the logistic costs associated to the current logistic organization.	X		
Planning labor costs	*Time spent on planning/week (h/week) * Labor force cost (€/h)*			X		
Preparation labor costs	*Time spent on preparation/week (h/week) * Labor force cost (€/h)*			X		
Delivery labor costs	*Time spent on delivery/week (h/week) * Labor force cost (€/h)*			X		

INDICATORS	CALCULATION	UNIT		Economic	Social	Ecological
Delivery costs	*Delivery labor cost (€/week) + Fuel costs (€/week)*	€/week	Summarizes the economic cost of delivery in its totality (labor and fuel)	X		
Total logistics costs	*Planning labor cost (€/week) + Preparation labor cost (€/week) + Delivery costs (€/week)*	€/week	Highlights the global cost caused by logistics (planning, preparation, delivery)	X		
Ratio logistics costs versus revenue	*Total logistics costs (€/week)/ Retail – wholesale revenue (€/week)*	%	Highlights the weight of logistic organization *Example : 1 euro of revenue correspond to x euro of logistic costs*	X		
Delivery distance profitability	*(Weekly revenue (€/week)/ Nb km travelled/ week (km/week))*100*	€ gained / 100 km travelled	Show the profitability of the travels *Example : 100 km of travel brings in x € of revenue*	X		
GHG emission	*Weekly fuel consumption (l/week)* GHG emission corresponding to the corresponding fuel (kg CO^2/l)*	CO_2 Kg/ week	Shows the ecological cost of the logistic organization *Example : The logistic organization of farmers release in average x kg of CO_2/week/farmer*			X
Energy intensity	*CO^2 emission (kg/week)/Weekly revenue (€/week)*	Kg CO_2 emitted / € gained	- Illustrates the ecological impact of the economic activity - Shows the dependence of the revenue toward energy *Example: Each euro gained causes a GHG emission of x kg of CO_2.*			X
Energy profitability	*Weekly revenue (€/week)/ Weekly fuel consumption (l/week)*	€ gained / Kg CO^2 emitted	- Shows the economic profitability of the ecological impact - Shows the dependence of the revenue toward energy *Example: Each kilo of emitted CO_2 corresponds to a gain of x euro.*	X		X

Appendix 3 : Farmers' questionnaire

Marketing channel (modality)	Selling points (Where)	When (delivery) ?	Sold volume of products in the selling points (ton or %)	What kinds of products are concerned by this outlet?	Revenue (€)
CSA type					
On farm selling					
Farmers market					
Farmers' shop					
Cooperative					
Shops					
NRC (institutional catering or restaurants)					
Supermarkets					
Other (precise)					
Total revenue on the farm		Portion of the revenue dedicated to the organic part of the farm (%)			

LOGISTICS OPERATIONS (Retail-wholesale outlets)			
Type of Modality (1 form per modality)			
PLANNING OPERATION			
Who initiate the order ?		The client	
		The farmer	
		A third party	
		Other (precise)	
Order frequency			
Order-delivery period		Current period	
		Wanted period	
How is the price decided?		By the client	
		By the farmer	
		Collectively chosen	
		Other (precise)	
Do you invoice the delivery costs?	Yes	Why? In which way ?	
	No	Why? Would you consider it?	
Concerted planning with client ?	Yes	How?	
	No	Why?	

Farm :	Date :

ADMINISTRATIVE OPERATIONS			
Following of the orders	Software		
	By hand		
	Not much following		
	Other (precise)		
Order payment	When?	During delivery	
		Monthly	
		Yearly	
		Other (precise)	
	Which way?	Cash	
		Check	
		Bank transfert	
		Other (precise)	

GENERAL ELEMENTS (all modalities included)			
Time spent on planning	h/week	Who does it?	
		Satisfactory? Suitable organization?	

Farm :	Date :

PHYSICAL OPERATIONS				
Order preparation	Who?			
	How?			
	Where?			
	How much time?	h/week		
Handling	Who?			
	How?			
	How much time?	h/week		
	Container/packaging type	Crate		
		Boxes		
		Palette		
		Other (precise)		
Transportation	Transportation mean	Truck		
		Van		
		Car		
		Other (precise)		
	Nature	Personal		
		Professional		
		Shared/pooled		
	Cold management	Refrigerated truck		
		Fridge		
		Ice box		
		Other (precise)		
	Capacity (m3 or ton)			
	Fuel type	Diesel		
		Gasoline		
		Electricity		
	Filling rate	At the start		
		Empty return?		
	Collaboration with other farmers ?	Yes (how and why)		
		No (Reason ?)		
	How much time?	h/week		
		Satisfactory situation?		
Storage	Capacity			
	Type	Refrigerated		
		Dry		
		Other (precise)		
	Pooling with other farmers?			

Appendix 4: Details of calculation of the chosen indicators

VARIABLES	DETAILS OF HOW WERE GATHERED THE VARIABLES
Total number of modalities	Deduced from the selling points listed by farmers during the interviews
Total number of selling points	
Number of retail-wholesale selling points	
Number of retail-wholesale modalities	
Main sale product(s)	Five categories : vegetables, dairy products, meat products, arboriculture and bread/flour
Distance per delivery route (km/week)	Deduced from the description of the different delivery routes of the farmers (selling points, day and order). If a deliveries are made less than weekly, distances are brought back to a weekly amount (*Ex: If 100 km are travelled every other week, 50 km are calculated per week*)
Total distance for retail-wholesale (km/week)	Sum of the distance travelled for all delivery routes
Average fuel consumption of the vehicle used (l/km)	If farmers do not know the average consumption of their vehicle, this is deduced from the model of the vehicle.
Annual revenue (€)	Estimation from the farmers
Revenue from retail-wholesale (€)	Estimation from the farmer on the distribution of the revenue depending on the modalities
Planning for retail-wholesale (h/week)	Time spent on orders anticipation, orders management and administrative follow up. Estimation from the farmers
Preparation for retail-wholesale (h/week)	Time spent on orders preparation (cleaning, sorting, making delivery batches, packaging) Estimation from the farmers
Delivery for retail-wholesale (h/week.)	Time spent during the deliveries (travel and handling) Estimation from the farmer
Fuel type	Enable to evaluate fuel costs to the closest of reality (difference between gasoline and diesel) as well as the GHG emission.

Appendix 5 : Details on interviewed key stakeholders of the local and organic retail-wholesale food system in Nord-Pas de Calais

Name of institution	Type of entities	Role of the interviewee within the entity	Reason for interviewing
Norabio	**Organic farmers cooperative**	Assignment manager for shops supply-farmers planner	100% organic cooperative in the Nord Pas de Calais region positioned on retail-wholesale outlets
		Vice-president (organic farmer)	Viewpoint of an administrator of Norabio on the logistics subject
Vert'Tige	**Specialized organic shop**	Manager (organic farmer)	Viewpoint of a shop depending on local supply
2 sous de table	**Restaurant 100% organic**	In charge of supply management	Viewpoint of commercial catering depending on local supply
CEB (Ecological and Organic Center)	**Wholesaler for organic products non-perishable**	Manager	Viewpoint of a wholesaler on local supply and the challenges associated with it
SCIC of transportation	**Cooperative Society of Collective Interests**	Driver and manager	Experience of shared-use truck and driver between farmers (organic and conventional)
Terre d'Opale/ Anges Gardiens	**Platform of production and diffusion of organic and local products**	Manager (Organic farmer)	Experience working with a functioning example of logistics collaboration (horizontal collaboration between farmers)
Croc La Vie	**Institutional catering for early childhood**	Charter member and manager	Viewpoint of institutional catering on organic local supply

Appendix 6 : Interview guide for farmers-Logistics collaboration

<table>
<tr><th colspan="6">LOGISTICS COLLABORATION</th></tr>
<tr><td rowspan="3">How do you evaluate the logistics performances on the farm ?</td><td></td><td>Satisfactory</td><td rowspan="3">Why?
What could be improved?</td><td colspan="2" rowspan="3"></td></tr>
<tr><td></td><td>Average (possible improvement)</td></tr>
<tr><td></td><td>Bad</td></tr>
<tr><td rowspan="2">Experiences with collaboration/ collective organizations? (currently or in the past)</td><td></td><td>Yes</td><td colspan="2">Assessment</td><td colspan="2" rowspan="2"></td></tr>
<tr><td></td><td>No</td><td colspan="2">Reasons?</td></tr>
<tr><td rowspan="3">Do you know the logistics of the farmers around you?</td><td></td><td>Very good</td><td rowspan="3">Possible collaborations?</td><td colspan="2" rowspan="3"></td></tr>
<tr><td></td><td>A little</td></tr>
<tr><td></td><td>Not at all</td></tr>
<tr><td colspan="3">What are the interests to logistics collaboration according to you?</td><td colspan="3"></td></tr>
<tr><td colspan="3">What are the obstacles to logistics collaboration according to you?</td><td colspan="3"></td></tr>
</table>

Appendix 7: Interview guide for studied LFS key stakeholders (besides farmers)

Interview guide for downstream commercial players

- Organization of the current supply
    - Description
    - Portion of local products
- Local supply
    - Why?
    - Difficulties?
    - Evolutions?
    - Constraints?
    - Improvement possible? Which one?
- Logistics collaboration?
    - Experience?
    - With who?
    - Why?
    - Obstacles?
    - Interests?
    - Potential collaborations?

Interview guide for players involved in a collaboration scheme

- Functioning of the current organization
    - Description
    - Collaboration part
        - Description
        - With who?
        - How
- History
    - Why did you start the collaboration?
    - Encountered challenges?
    - Evolutions?
    - Constraints?
    - Possible improvements? Which ones?
    - Possible future?

Appendix 8 : Multiple choice grids for farmers-logistics collaboration

Farm :	**Date :**

According to you what are the main interests for logistics collaboration?		Reducing logistics costs
		Decreasing GHG gazes
		Accessing new markets
		Accessing information
		Increasing time availability for production
		Positive image that it brings
		Increasing time availability for family or leisure
		Other (precise)

Main obstacles to logistics collaboration according to you		Bad performances of the partners	Lack of confidence between partners
		Competition	
		Loss of contact with the client	Loss of relationship
		Loss of social link	
		Fear of the implementation phase	Cultural elements
		Different working hours	Increasing complexity of the organization
		No logistics competencies	
		Isolation from other farmers	
		Seasonality	
		Products variety, no match with my own products (regulation, temperature)	
		Interdependence	Loss of dependence
		Loss of control of my logistics	
		Lack of information about the delivery route of everyone	Lack of information, knowledge toward partners
		Lack of information on the motivation and objectives of everyone	
		Other (Precise)	

Appendix 9 : Detailled quantitative results linked to the interests to logistics collaboration identified by interviewed farmers

			CONTENT ANALYSIS			MULTIPLE CHOICE GRID ANALYSIS			
THEME	**CATEGORY**	**PRECISIONS ON THE CATEGORY**	**Percentage of farmers having spontaneously mentioned this interest during the discussion**		**Recurrence of this interest on the speech of the farmers mentioning it**	**How many farmers chose it as part of the 3 major interests**		**Average points given for this interest on the sample (on a scale from 1 to 3)**	
Interests to logistics collaboration	Accessing new markets	Client pooling	29%	67%	1	50%	90%	0.9	1.8
		Obtaining a critical size	19%		1	25%		0.5	
		Larger variety of products	19%		2	15%		0.4	
	Increasing time availability	For production	48%	57%	1.6	60%	80%	1.5	1.8
		For family and leisure	10%		2.5	20%		0.3	
	Logistics costs reduction		43%		1.1	85%		1.9	
	GHG emission reduction		14%		1	35%		0.5	
	Increasing exchanges between farmers		5%		1	10%		0.1	

Appendix 10 : Detailled quantitative results linked to the obstacles for logistics collaboration identified by interviewed farmers

			CONTENT ANALYSIS			MULTIPLE CHOICE GRID ANALYSIS	
THEME	**CATEGORY**	**CATEGORY SPECIFICS**	**Number of farmers mentioning the obstacle during the interview**		**Recurrence of this obstacle in the speech of the farmers having mentioning it**	**Percentage of farmers who chose it as part of the 3 major obstacle**	**Average points associated to the obstacle (1 to 3 scale, 1 being the most important)**
Obstacles for logistics collaboration	Singularity of each system	Product variety	43%	100%	1.8	85%	1,6
		Client variety	10%		1,0		
		Container/Packaging variety	10%		1,0		
		Different working hours	24%		1,4		
		Different vision of the profession	14%		2,3		
	Lack of confidence	Competition	38%	90%	1,4	85%	1,7
		Low performances of the partners – Punctuality	33%		1,4		
		Low performances of the partners – Handling of the goods	10%		2,5		
		Lack of self-confidence	10%		1.0		
	Loss of human relationship	With the client	48%	62%	1,7	40%	1
		Lacking "change of scenery"	14%		1,0		
	Isolation from other farmers				1,4	15%	0,4
	Cultural elements	Resistance to change	10%	48%	1,0	40%	0,8
		Individualism	38%		1,3		
	Loss of independence		24%		2	25%	0,6
	Lack of time to reflect on their organization		24%		1.6	0%	0
	Difficulty to find a fair system		19%		1.0	0%	0

DIAGNOSTIC
LOGISTICS PERFORMANCES
Retail-wholesale outlets

Farmer 1

July 2014

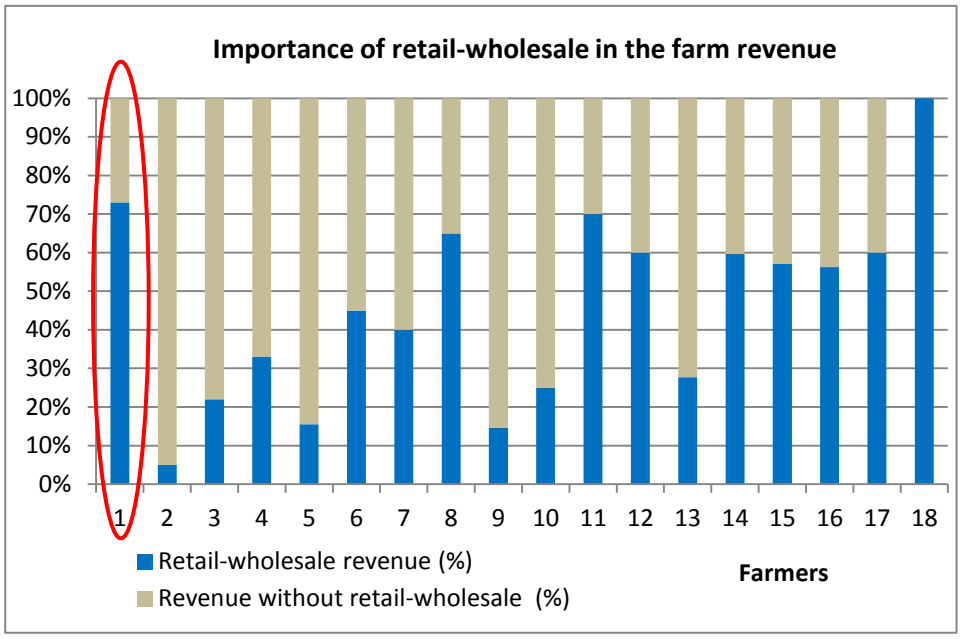
This document has been realized further to an interview realized the 18 June 2014 on logistics organization in the retail-wholesale outlets. Data correspond to the data gathered during this interview.

This document presents an individual analysis on logistics and its performances. It is composed on:

- *Presentation of the **general characteristics of the retail-wholesale activity***
- ***Economic performances** of the logistics on the farm*
- ***Ecological performances** of the logistics on the farm*
- ***Social performances** of the logistics on the farm*

GABNOR
Agriculteurs BIO du Nord-Pas-de-Ca

GENERAL CHARACTERISTICS OF THE RETAIL-WHOLESALE ACTIVITY



73 %

=

Portion of the retail-wholesale activity in the total revenue on the farm

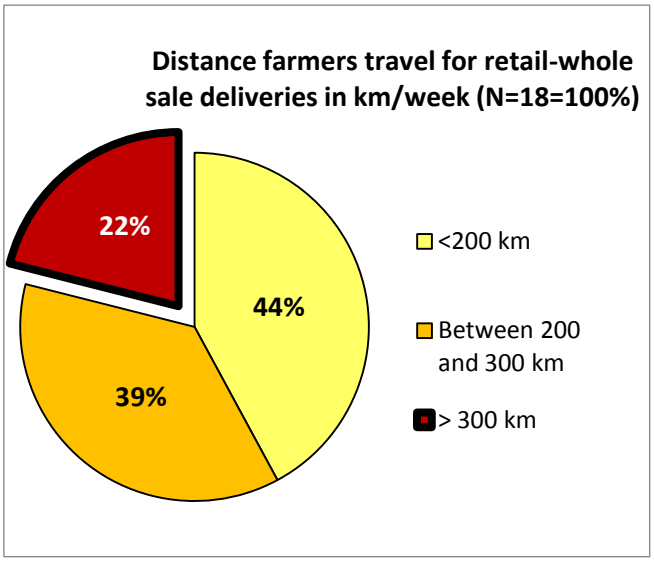
	TOTAL on the farm	RETAIL-WHOLESALE
Modality number: Outlet having the same characteristics (example: CSA, farmer's markets, supermarkets, shops)	6	3
Number of selling points:	9	8

89% = **Portion of the farm selling points that are retail-wholesale**

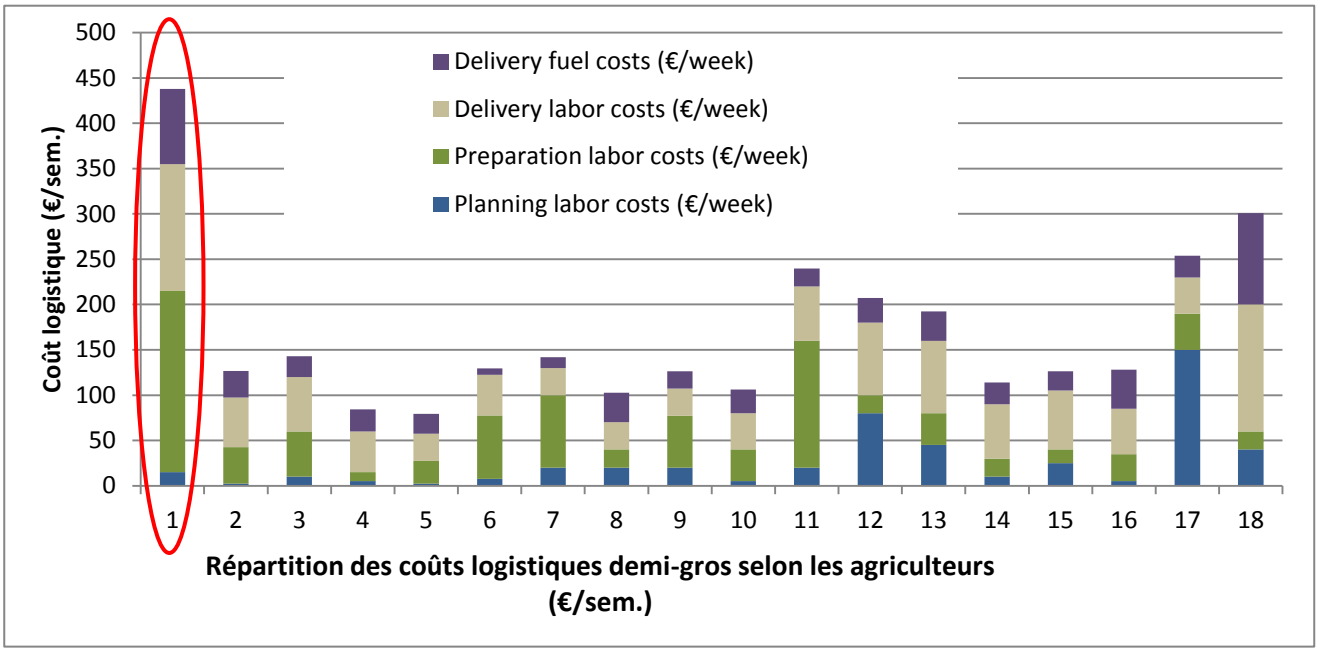
486

=

Number of km travelled/week (retail-wholesale activity)



ECONOMIC APPROACH

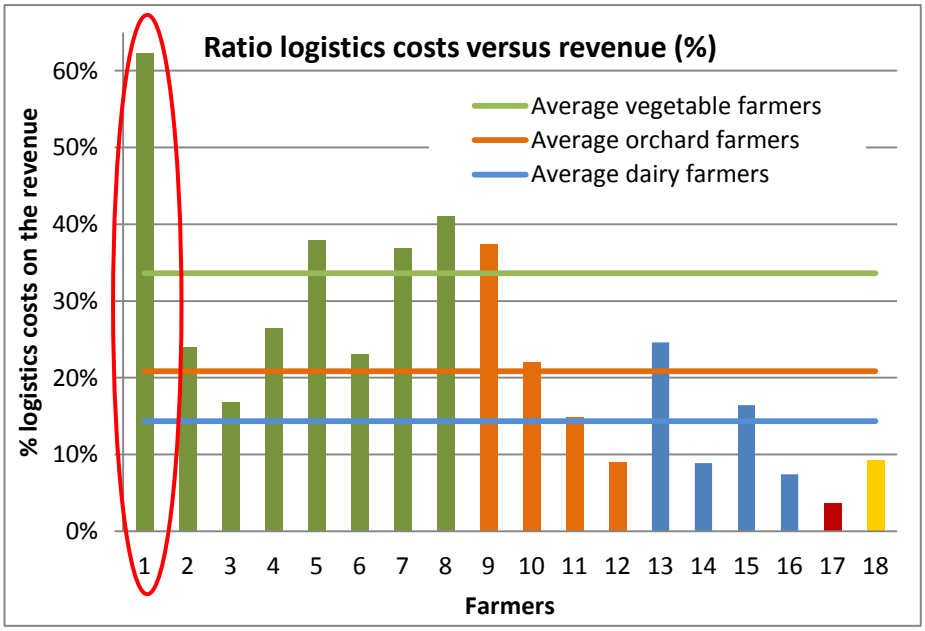


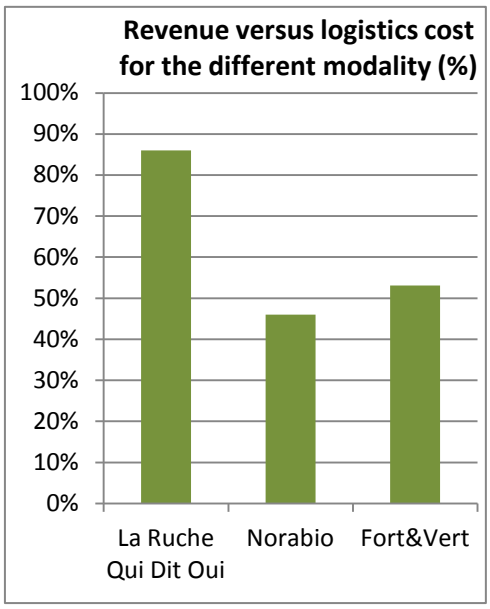
Logistics costs (€/week)		RETAIL-WHOLSALE		Detail modalities: La Ruche qui Dit Oui (CSA type)		Norabio (cooperative)		Fort & Vert (retail-wholesaler)	
Planning costs (€/week)		**15 €**		5 €		5 €		5 €	
Preparation costs (€/week)		**200 €**		80 €		60 €		60 €	
Delivery costs (€/week)	***Labor costs*** (€/week)	**140 €**	**223 €**	100 €	130 €	20	46 €	20	47 €
	Fuel (€/week)	**83 €**		30 €		26		27	
Total logistics costs		**428€/week**		**215 €/week**		**111 €/week**		**112 €/week**	

1€ of revenue

=

0.62 € of logistics costs





ECONOMIC APPROACH (next part)

1 € of revenue=

For RQDO: 0.86 €

For Norabio: 0.46 €

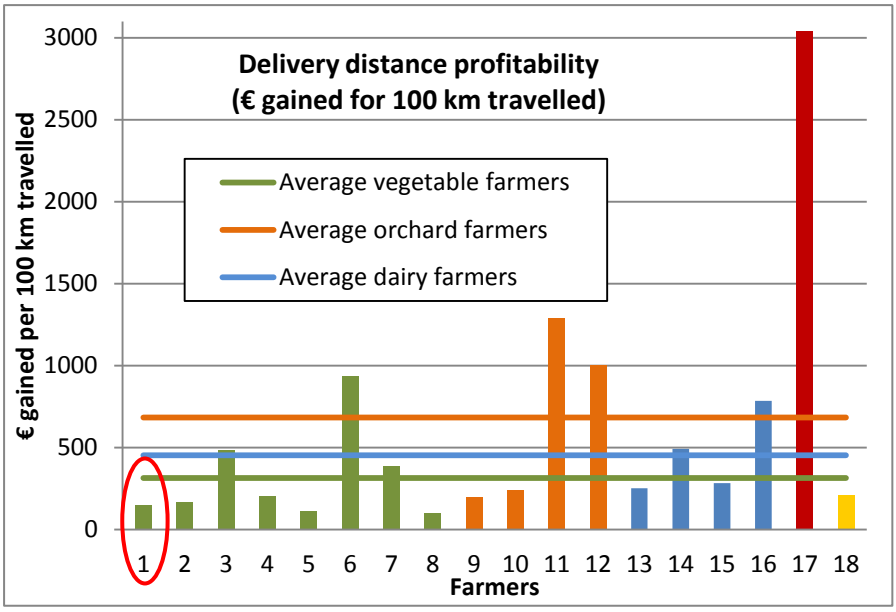
For Fort &Vert: 0.53 €

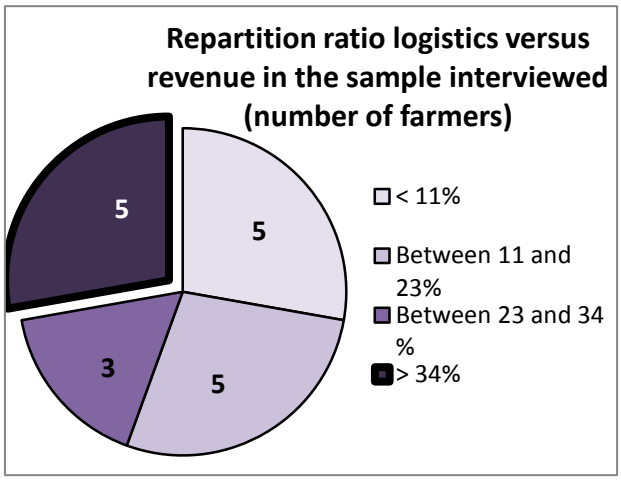
… Of logistics costs

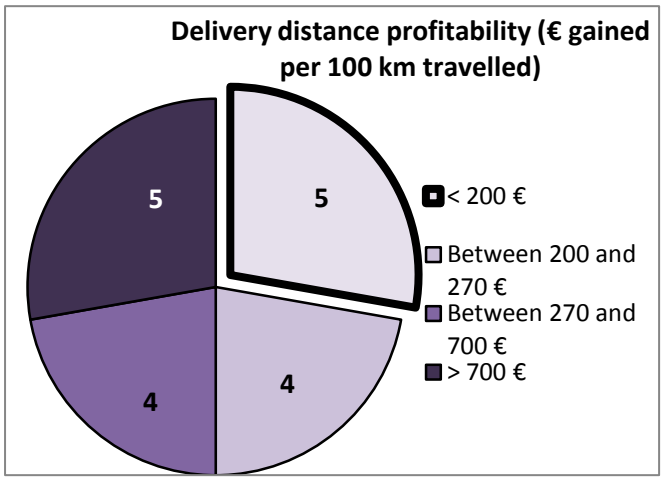
144 €

=

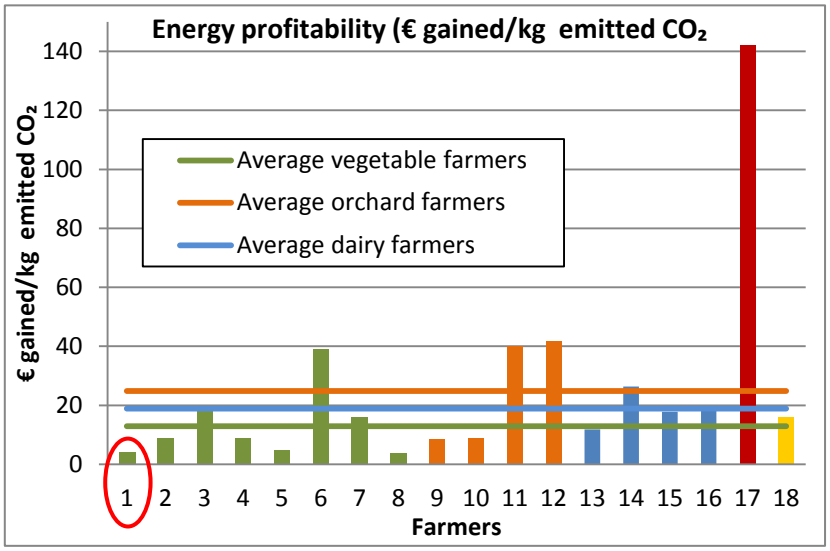
Revenue gained for 100 km travelled







ECOLOGICAL APPROACH



11 €

=

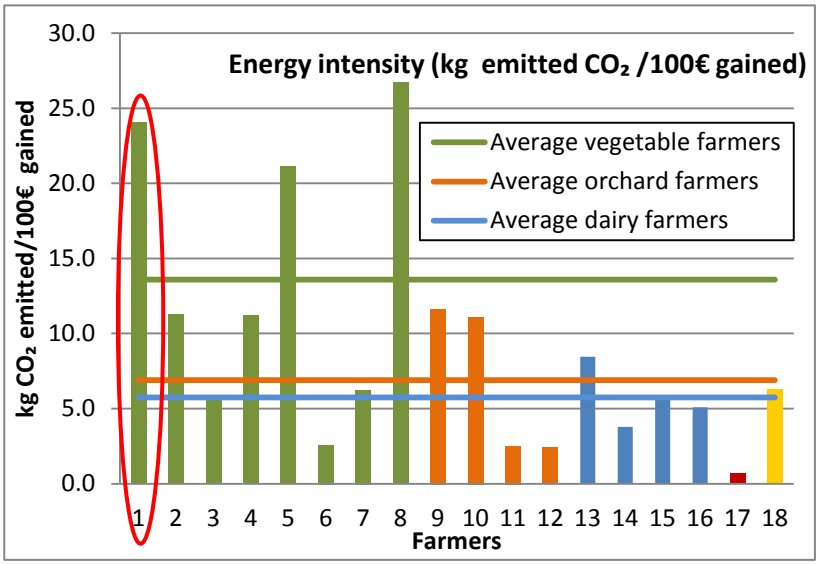
Revenue gained per fuel liter consumed

Green House Gases emission link to retail-wholesale activity on the farm

8.8 T CO_2/an

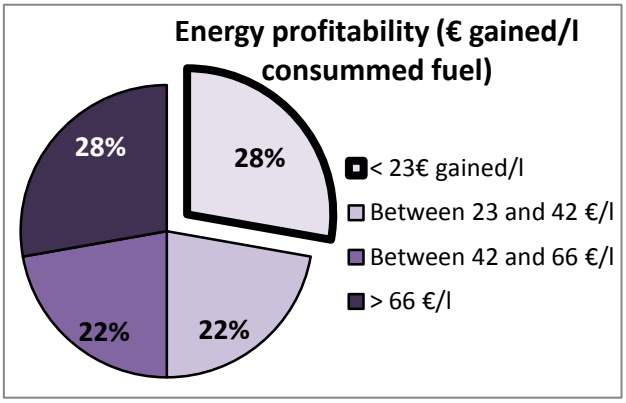
4.2 T CO_2/year

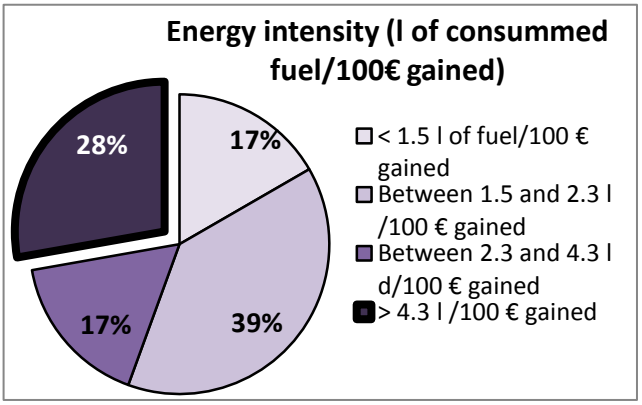
It is the CO_2 emission link to movement of people per house in France



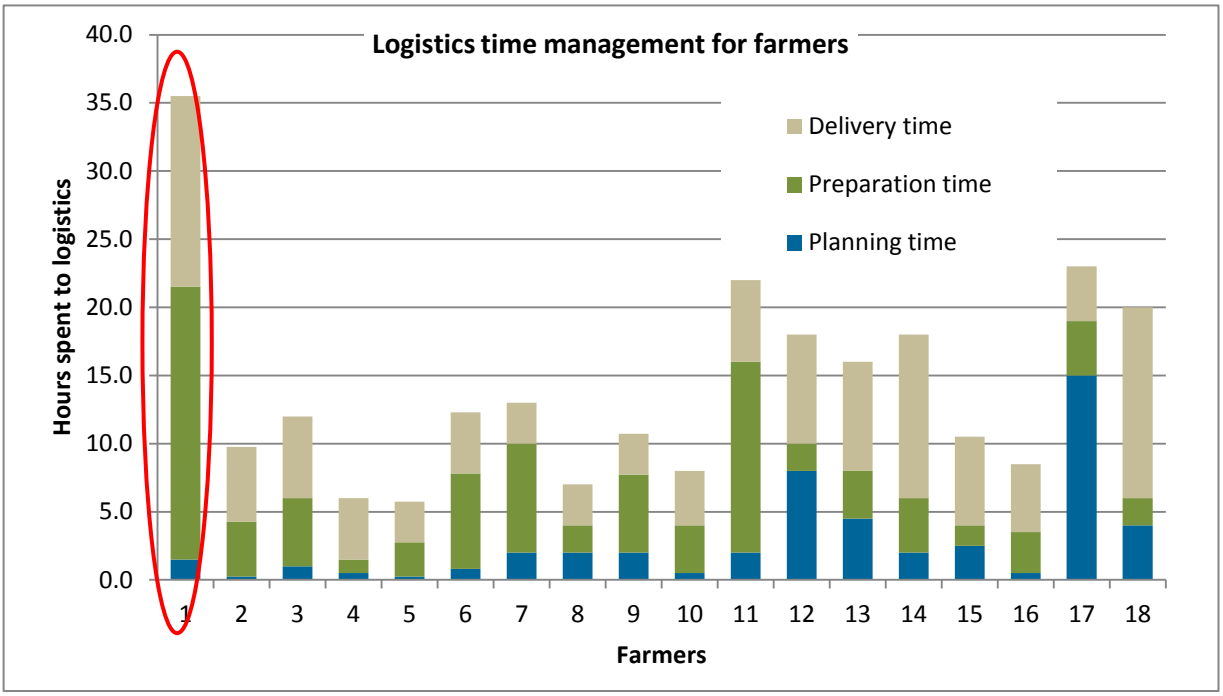
***1 l** de gasoline consumed =*
***2.67 kg** of CO_2 emitted*

		La Ruche qui dit Oui	Norabio	Fort &Vert	DEMI-GROS
Energy profitability	€ gained/ l consumed fuel	11 €	12 €	10 €	**11 €**
	€ gained/Kg CO_2 emitted	4.1 €	4.6 €	3.8 €	**4 €**
Energy intensity	l of consumed fuel /100€ gained	9.2 l	8.1 l	9.8 l	**9 l**
	Kg CO_2 emitted /100€ gained	24.4 kg CO_2	21.7 kg CO_2	26.3 kg CO_2	**24 kg CO_2**





SOCIAL APPROACH



Time spent to logistics (h/week)		La Ruche qui Dit Oui	Norabio	Fort & Vert
Time for planning	1h30	30 min	30 min	30 min
Time for preparation	20 h	8 h	6 h	6 h
Time for delivery	14 h	10 h	2 h	2 h
Total time for logistics	**35h30**	**18h30**	**8h30**	**8h30**

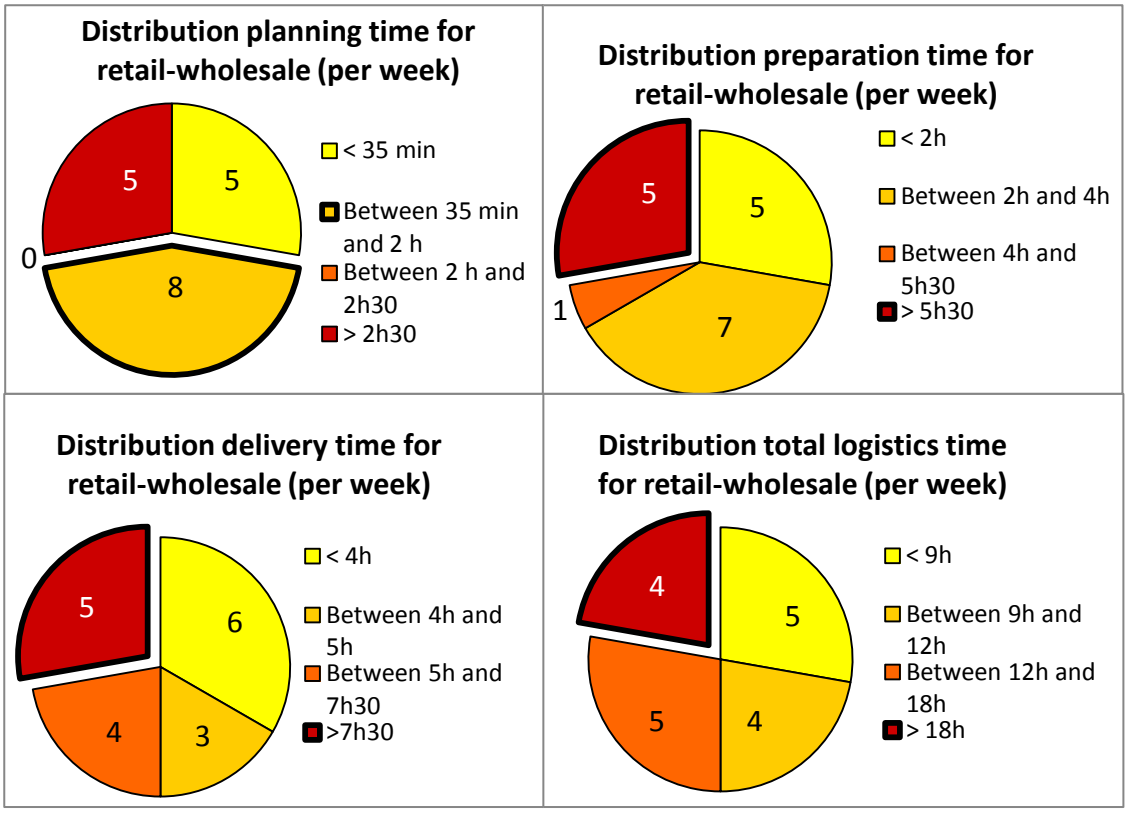


Table of contents

Table of appendices

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