

Sustainable Short Circuits

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Abstract—The supply chain is a complex network of actors from upstream to downstream, composed mainly of suppliers, manufacturers, distributors and logistics platforms, customers, which are linked together to create values in the form of goods and services. Supply chain management stems from the internationalization of trade and a desire for better management of the actors, across the supply chain. In this regard, the information flow can enable managers to effectively coordinate the actors of the supply chain. However, because of the complexity, supply chain management experiences the difficulty. The outsourced productions in different countries are difficult to manage, information does not pass and certain productions are against the ethics of universal human rights and sustainable development. Moreover, following food or textile scandals, customers are more conscious of what they consume. Through this research, based on a literature review, we question the use of short circuits as the solutions to manage better the supply chains from suppliers to customers. We will therefore focus on the pros and cons of short circuits by reviewing relevant work from various angles, and to try to understand more concretely the challenges of short circuits, by focusing on alimentary short circuits as an example.

Keywords—complexity, supply chain, short circuit, sustainability, management, information flow

I. INTRODUCTION

The recent challenges of climate change, industrial scandals, aspirations for new sustainable patterns that respect the future generations invite us to rethink the different production systems. One of these new patterns is to bring the producer closer to the consumer which can be called short circuit, as a local response to global issues. This approach can be realized in different forms, from farm sales to collective stores. It is therefore necessary to understand its advantages, its weaknesses and its long-term perspectives, in the other term, its real impact on sustainability.

In a first general section, we will analyze globally the short circuits. So, we will review its history and the reasons that it came back in force, its contributions, and its business model. In the second section, we will talk about agricultural industry, as an example of the sustainable development. Finally, in a third section, we will question the effectiveness of short circuits. Despite, the use of the short circuits as a possible response to the sustainability issues related to the globalization,

numerous studies show that the environmental impact of the short circuits remains mixed (Blanquart and Gonçalves, 2011; Blanquart *et al.*, 2015; Boutry and Ferru, 2016). So, the question that can be raised is to know if a short circuit is necessarily sustainable circuit.

II. SHORT CIRCUITS

A. History

From the artisanal era, short circuits have existed under different forms, from donations, to exchanges and to trades. The diversity of businesses settled in common areas and each was replying the need of its city and became the production source of that city. So, the short circuit was an historical supply function for towns, particularly in agricultural products. To clarify, we call a logistical pattern, a short circuit, when it involves a maximum of one person as an intermediary between the producer and the consumer (Cauchois *et al.*, 2017). During the mass production era, after the Second World War, the industrial revolution appeared. Thanks to the standardization, new forms of production have emerged. To be more competitive, companies in the search of low-cost resources outsourced their operations to the region of the world where the resources were cheaper. To take the advantages of the economy of scale, the large distribution was created. The first European hypermarkets were created in Brussels in 1961. In addition, the market share of large and medium-sized supermarkets in just one year for food has increased by 64% (Den éch ère, 2007). However, during from this period, the resources started to be used massively and pollution increased and as a consequence the globalization had a negative impact on humans and the environment. It was in the 1990s that researchers proved that globalization are modifying and depleting our natural resources. Today, short circuits are seen as a solution to some of these problems. However, new appearance of these approaches is open to criticism for their unethical practice (El-Nemr *et al.*, 2017).

B. Sustainable Logistics

Strategic logistics decisions are always geared towards a desire to reduce costs and improve service levels. But nowadays they have also turned into the desire of managing waste, reducing pollution and reducing the environmental footprint of the products. So, it is essential to think of a more responsible purchase of raw materials, less polluting production and more ethical transport, and that concerns all the links of the logistics, from the supply

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to the delivery to the customer. As a result, researchers and practitioners started to be more aware of the polluting impact of certain industries and the governments imposed different regulations to the businesses. At the other side, companies to be more competitive tried to improve their image. As a result, sustainable logistics was formed to be more responsible and greener, for example, by purchasing sustainable materials, by empowering the production processes with more ecological means, by reducing the number of packaging and or using biodegradable packaging, by reducing the unnecessary trips to the warehouse and during order preparation, by optimizing the transport, in order to reduce the travelled distances, and using fewer polluting vehicles and avoiding empty returns.

The short circuit is a sustainable logistics approach, which covers the desire to produce organic labeled products, to avoid as much packaging as possible, to guarantee the freshness of the product through a just-in-time delivery, and to reduce travel as much as possible. However, according to some studies a short circuit is not necessarily a sustainable circuit, especially, when there exist high vehicle loading rates, empty journeys and the difficulties in the organization of rounds if there are several points to serve. In addition, this touring organization requires the product closer to the end customer in rural areas or to serve a dense population pool such as an urban area. It is essential to mention that in an effective short-circuit, distance counts, means of transportation journeys of consumers and those of employees of production and sales sites count (Goncalves and Zeroual, 2014). To understand whether short circuits are really capable of supporting a sustainable supply chain, we have decided to focus on the alimentary sector, as a concrete example.

III. SUSTAINABLE FOOD

According to the Food and Agriculture Organization of the United Nations, in 2010, a sustainable food, which characterized by its contributions to protecting and respect of biodiversity and ecosystems, is culturally acceptable, economically equitable and accessible, affordable, safe and healthy, and help optimize natural and human resources. As a result, it provides an appropriate diet which meets the following criteria:

- A diet accessible to all, healthy and balanced, meeting human nutritional needs;
- A system that preserves the environment, climate, soil, water, biodiversity;
- A diet that relies on the local, national and on sustainable agricultural production methods, ensuring a fair income for producers, and preserving the rural fabric and local development.

A. Multiple Benefits

Sustainable food ensures the satisfaction of vital needs by integrating the established conditions of the world food system, which concerns the three pillars of sustainable development, related to social, economic and environmental development. Its challenges are multiple.

First of all, it makes it possible to feed the entire world population by limiting the pathologies of over-nutrition, such as malnutrition and undernutrition of the elderly. It also promotes the reduction of food and health inequalities in both developed and developing countries. Sustainable food aims to control the ecological impact of food systems by preserving natural environments and minimizing greenhouse gas emissions. In addition, it ensures the maintenance of economic development and employment, in fact the food industries are one of the first industrial sector with the largest employer. It thus allows access to food for as many people as possible. Finally, it makes sure to measure the impact of global changes on food systems, more particularly their resilience in relation to ecological and economic instabilities.

B. Sustainable Logistics of Food

Sustainable food distribution aims to improve the environmental performance of the logistics systems beyond a simple coordination between functional areas. Among the main challenges of the sustainable food distribution we can mention to the improvement of the transportation infrastructures, the optimization of transport, the use of mixed transport, the optimization of packaging, and the creation of stores or warehouses confirm to high environmental quality standards, the reduction of unnecessary trips or empty truck returns, and the optimization of movements. Some observed initiatives are the adaption of an eco-tax on road transport, the use of bicycles, the investment in new urban projects to reduce pollution (Loivet *et al.*, 2020; Mahfod *et al.* 2019; Merimi and Taghipour, 2021).

C. Growth of Local Food Retailing

What are the reasons for this growth? It is possible to study these reasons from two points of view of consumers and producers.

1) Customers

Consumers pay more attention to their alimentations. According to the Natural Marketing Institute, 71% of French people prefer to buy local products. The demand for sustainable products using short circuit are increasing more and more. It is because, buying local food products means first of all having a guarantee of freshness, given the fact that the time for transporting and storing products is limited. But buying local products also helps to reduce carbon emissions, because local products are not transported by the long transport and in refrigerated trucks or air transport.

2) Producers

Small independent producers of food products, such as farmers, as well as cooperatives are often less competitive in the term of price comparing with large distributors. By eliminating intermediaries between consumers and producers, short circuits allow the latter to sell their product at fair value. In this case, the argument of "best selling prices" helps to understand the interest of local producers in selling locally rather than to large distributors. Studies have shown that the remuneration of

producers who sell locally were not lower than those who sell to large retailers.

D. Technical Analysis of Food Short Circuits

There are several types of “short circuits”. Each represents a particular sales method and state of mind. We take up these two points here.

1) Typology of short local circuits

The term “short circuits” encompasses several kinds of circuits:

- The “face-to-face” circuit: the consumer buys a product directly from the producer. Authenticity and trust are expressed through the personal interaction between the two actors. To involve more people in this type of trade, some producers use new trade networks such as the Internet, or new application, especially for textiles.
- The “spatial” circuit: the products are manufactured and retailed in the region of production, and consumers are informed by the “local” label of the products.
- The “extended spatial” circuit (less than 150 km): sales information is communicated through networks to the surrounding regions.

2) Selling methods specific to short circuits

The most sold agricultural products in short circuits are fruits and vegetables. Here are the main selling methods:

- Direct sale at the farm: The sale at the farm is the main mode of selling. The marketing of the products can be carried out in the name producer or through a legal entity. In France, the producer carries out the marketing essentially in his own name, either by direct sale to the consumer, or by sale via another short circuit. In direct sales, the main selling method is farm sales (picking, farm market, etc.). In addition, for one in ten, online selling (internet or apps) is very common. Moreover, three out of five farms are connected to the internet. The sale in baskets is very little developed in the countryside and remains a neo-rural movement. In indirect sales with a single intermediary, these are essentially sales through retailers, large and medium-sized stores. Selling to commercial or collective catering (canteens and restaurants) is minimal. In addition, only one out of ten farms declare that they have “Organic farming” certification. However, it is two thirds of farms with this certification that market in a short circuit. In addition, a third of farms selling in a short circuit practice a diversification activity. The main activities are the processing of other agricultural products (cider, fruit juices, meat products, non-wine alcohol, etc.).
- Co-operative supermarkets: This system was created in the United States with the Park Slope Food Coop in a Brooklyn neighborhood. The goal is that consumer to also be an employee of the store. For this, he or she buys a share of the capital and guarantees to work once a week as a volunteer. The time of working for the New York store is four hours per week. Some employees are nevertheless

hired on permanent contracts to manage orders with suppliers who must ensure the sale of an organic and local product. The products are affordable and of good quality. The customer is aware of what he or she buys because he or she invests himself/herself in the store. This system has been booming since its creation, two stores have opened in France, in Paris and Toulouse.

- Collective points of sale: Several farmers produce different products, group together and manage a store together, often of the “supermarket” type. Producers undertake to spend a certain amount of time at the point of sale and staff are hired specifically for this. The main advantages are: a reduction in working time dedicated to sales for producers, mutualization for the construction of the store and the possibility of the participation of customers. However, it is essential for the success of this kind of project that the initiative comes from the producers themselves. In France there is an example of this type of store in Annecy.
- Peasant baskets: delivery to homes, businesses or pick-up points. The products sold are meat, vegetables, cheese and dairy products (in the basket). Originally created in Provence, the Panier Paysan now brings together many initiatives throughout France. They supply restaurants directly and leave their farms available to be able to pick or harvest their own vegetables.

3) Short local food supply chain: assurance

In a short local food chain, what is central is that the product reaches the consumer with quality supported by specific information, mentioned on the packaging or communicated to the consumer at the point of sale. This information creates a particular assurance, which allows the consumer to identify the place of production, potentially, the production methods used. As a result, consumers may be willing to pay more for the products they trust.

A key characteristic of short supply chains is their ability to socialize. The consumer can share their opinions about the products with producers. So, they are served to improve the image of the producers. Short supply chains seek to redefine the relationship between producers and consumers by giving clear explanations of the origin of the product. Short supply chains are also expressions of attempts by producers and consumers to establish new types of supply and demand. They give a strong meaning to the relationship that develops between them.

IV. ENVIRONMENTAL EFFICIENCY

A. Challenges and Limits for Producers

- The food industry has prioritized profit over quality. However, a short circuit system favors first and foremost the quality of production. In this regard, an organic agricultural system based on natural methods can reduce public health risks and improve the quality of life. From the 1950s, the term organic

farming appeared. For the producers, they must respect:

- Since 1991: quality norms and methods of control defined by interprofessional agreements where the state play the role of arbiter in decisions and guarantor. These are private companies that deal with the control and certification of producers. However, it can be modified by the state itself. As an example, it is forbidden to use synthetic chemistry.
- Since 2009, its criteria have been aligned with the European organic label, which is less restrictive than the initial one and authorizes so-called accidental traces. Foods must be 95% composed of ingredients from the organic production method. Its certification under the control of an organization created by the French public authorities.

In addition, an important issue when working in a short circuit is the social link that is created with the consumer to build customer loyalty. We are not only a producer but also a seller. This is an advantage because producers know their products. So, they guarantee their quality. In addition, the majority of producers live close to their places of work and can therefore easily get there. In addition, few employees are employed.

A whole food packaging and packaging system must be taken care of for transport. Some producers are versatile, selling on the farm, on the internet, in the markets and even on the internet. As the ISO2200 law has planned to control.

Despite these environmental and social benefits. Several studies wishing to compare the mass distribution to the short food circuit. In Mundler and Rumpus (2012), the authors present results concerning the energy consumption of three food products by comparing, for each, regional and global supply chains. This research highlights the positive impact of short circuits related to production and transportation. This work shows the lower final energy consumption in these systems. However, by considering the rules of economy of scale it can be understood that the final energy consumption is higher in the case of regional productions based on the efficiency of each mode of transport (Nadia *et al.*, 2020). In fact, short circuits are penalized by the small quantities sold despite the short distances travelled (Shin and Taghipour, 2021; Taghipour and Frayret, 2021a). However, previous research works are open to criticism because the authors do not consider the movement of consumers and of employees (Taghipour and Frayret, 2021b; Taghipour *et al.*, 2021; Taghipour, 2014; Taghipour *et al.*, 2014).

B. Challenges and Limits for Consumers

The stakes are higher for consumers because they want to be ensured from the quality of products. So, they have created or intensified these new short circuit systems (Taghoipour *et al.*, 2015; Taghipour, 2018). They then become:

- Responsible for the sorting of wastes, because the packaging is most often all recyclable or to be returned to the producer (Taghipour, 2020).

- Tester of the producer's products and can give produceers advice on how to improve or even discuss the taste of the product (Taghipour and Beneteau-Piet, 2020)

The limits defined by the consumer would be:

- Do not find exotic products that are found via long circuits (Taghipour and Merimi, 2021).
- Depending on the products, prices can be higher and we often have to build loyalty over the long term (Tliche *et al.*, 2019).
- Do not choose to have a choice of products and the weight of the basket varies according to production and climate (Tliche *et al.*, 2021).
- Make more trips between supermarkets, farms, so having to use the car more (Vosooghizaji *et al.*, 2020 & 2022; Yang *et al.*, 2017).

V. CONCLUSION

The logistics of short-circuits do have an impact on durability. Through the study of several scientific papers, the comparison of the collected data and interviews with the professionals we were able to answer this question. We compared several short circuit distribution systems with large distribution systems. We emphasized the importance of pooling transportation system. We have also introduced the various issues that will impact the future of logistics and to turn to more responsible logistics. Despite the fact that research on short food circuits is mainly based on the basket system, it would be important and innovative to study short-circuits systems in other sectors.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Xiaowen Lu conducted the research; both authors analyzed the papers; wrote the paper; all authors had approved the final version.

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