Towards a Sustainable Agri-food Supply Chain Model. The Case of LEAF

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Abstract The Agri-food Supply Chain (ASC) has received increasing attention lately due to environmental and social impacts. This is likely to lead to tighter regulations and closer control of these supply chains, where the traditional ASC practices will be reviewed and changed. One of the key solutions may be the necessity of establishing procedures accounting for the sustainability of the whole ASC. This is directly related to the increasing presence of different ASC third parties offering this type of services. In this paper, different aspects about ASC sustainability are reviewed from the literature, with the aim of finding out which are the most addressed and remarkable ones. These ones will be used as a benchmark against an example of a real sustainable ASC management model implemented by the UK established company (LEAF-Linking Environment And Farming).

Keywords Agri-food supply chain · Sustainability models · LEAF company

1 Introduction

Agri-food industry is one of the most important sectors in the world, and remains one of the largest manufacturing sectors in many developed and developing countries. Although this industry has become very efficient, it is still dependent on significant

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amounts of natural resources and faces growing demands in demonstrating responsibility. Increasingly there is a spotlight on the sustainable food supply to reduce its impact environmentally and socially.

Improving sustainability requires a deep understanding of the relationships between food consumption behaviours, retailing, processing and distribution activities, as well as agricultural production practices. The links between social needs, the economic processes involved in meeting them, and the associated environmental consequences must be properly determined (Heller and Keioleian 2003).

The opening of domestic markets to international competition throughout the world will undoubtedly result in shifting the focus from a single echelon, such as the farmer, to the sustainability of the overall supply chain. In order to meet these new challenges, it is necessary to take a critical look at the current supply chain practices to determine the best strategies to accommodate the new global conditions. This is increasingly important as standards are raised whether for food safety, environmental and social responsibility, animal welfare and quality.

Therefore, more than ever, sustainability must be seen in terms of the wider agri-food system, especially the vertical linkages in the food supply chain beyond, but including, the farm. Emphasis on sustainable food chains is critical since the food chain, as a whole, is the ultimate framework to demonstrate sustainability (Ilbery and Maye 2005).

This focus on achieving "the overall ASC sustainability" has become an increasingly important business imperative as "stakeholders are demanding more transparency and companies themselves are under increasing competitive and regulatory pressures to demonstrate a commitment to sustainable practices (Jones et al. 2014). In this sense new businesses (acting as ASC independent external organizations) are becoming more relevant offering services such as promoting, enabling, certifying and endorsing sustainable practices to the different stakeholders making up the ASC.

From the analysis of the literature this paper aims to clearly define sustainability and addressing what are the most important issues for a successful and sustainable ASC management. These issues will be subsequently be used as a benchmark of a real sustainable ASC management model implemented by the UK established company (LEAF- Linking Environment And Farming).

The paper is structured as follows: in Sect. 2 a brief literature review about the concept of "sustainability" in the ASC is conducted, while in Sect. 3 the most important aspects that must be addressed for sustainable ASC management are analyzed. In Sect. 4 a real case-study is described. Finally, in Sect. 5 some conclusions are drawn.

2 Sustainability in the Agri-food Supply Chain

The term agri-food supply chains (ASC) has been coined to describe the activities from production to distribution that bring agricultural or horticultural products from the farm to the fork. Therefore, ASC are formed by the organizations responsible for

production (farmers), distribution, processing, and marketing of agricultural products to the final consumers (Prima et al. 2016).

The supply chain of agri-foods, as any other supply chain, is a complex network of different actors working together in different processes and activities in order to bring products and services to the market, with the purpose of satisfying customers' demands. What mainly differentiates ASC from other supply chains is the limited products shelf-life and the importance that consumers give to aspects such as quality and health. Other relevant characteristics of agri-foods include coping with high levels of uncertainty due to the weather's unexpected variations and products demand and price variability and volatility. Furthermore, trade, tariffs and political agreements and complexity also impact the ASC. These issues together with the increasing awareness in environmental and social issues make the underlying supply chain more complex and harder to manage than other supply chains.

Environmental and social issues are why ASC's sustainability has become such a popular term in the last decade. But, what does sustainability really mean? Within our review the literature states that three broad dimensions characterize the term "sustainable": economic, environmental and social:

1. Economic sustainability: economic aspects are critical drivers in food business processes which implement sustainability. These dimensions refer to an allocation of resources in an appropriate manner to achieve efficiency and competitiveness to enhance contribution to the society. The implementation of sustainability may lead to an incremental cost while adjusting internal and external facilities to create the advantages for all food business partners. It is noticeable to remark that sustainability in the food industry must find the balance between quality and cost-effectiveness (Li et al. 2014), while also ensuring a fair return to each part of the ASC.
2. Environmental sustainability: decision making does not only consider the economic aspects, but also environmental (or ecological). These later ones basically include prevention of pollution and waste and efficient use of scarce resources such as land, energy and water (Gerbens-Leenes et al. 2003), but also reducing Greenhouse gas emissions and the enhancement of habitats and biodiversity.
3. Social sustainability: social aspects are mainly related to health and safety, employee motivation, turnover and recruitment costs, working conditions, organizational reputation and supplier relationships (Bendul et al. 2016). Other areas are also the importance of fair trading conditions and also increasingly public engagement within an increasingly urban society.

3 Key Issues for Sustainable ASC Management

In this third section a brief review from existing literature about the most addressed and remarkable issues for sustainable ASC management is conducted.

Integration along the whole ASC to achieve sustainability is complex. All the actors must prioritize their financial benefits but at the same time considering the increasing demand on social and environmental aspects. Sustainable ASC management is important to be applied as it will influence not only internal organizations but also external relationship with other parties. (Li et al. 2014).

In this sense, three main ideas from the state of the art have been concluded.

Firstly, that *there are just a few studies focusing on integrated collaboration to achieve sustainable ASC* (Mota et al. 2015). Additionally, most of the studies only consider the trade-off between economic and environmental aspects, neglecting social ones. These studies only focus on environmental (known as green ASC by some authors) and economic aspects attempting to turn environmental impact into economic value in their models. Just a few articles focus on social aspects, mainly related with health and safety, employee motivation, turnover and recruitment costs, working conditions, organizational reputation and supplier relationships. Besides they are mostly tackled in a operational manner, leaving apart their necessary strategic perspective. However, some research considered the 3 sustainability dimensions in their proposed model such as Bourlakis et al. (2014).

Secondly, *many studies assume that all sustainability measurement indicators are independent* (Gerbens-Leenes et al. 2003). The enormous number of indicators found in the literature generates too much data that often provide no additional knowledge on the sustainability of a system. Moreover, although research has addressed many aspects of sustainability, it has often ignored the interactions.

Finally, *there are a significant amount of studies just covering certain ASC stages* (Prima et al. 2016). Whole supply chain sustainability is not an easy task since it requires the joint collaboration of all its stakeholders (a high degree of vertical integration must exist). An ideal integration scheme would involve sharing information and infrastructure, skills and knowledge among all of them. Unfortunately, there is great complexity in its real-life application, and particularly in the agri-food industry due to its special characteristics (as aforementioned in Sect. 2). Moreover, the existence of global regulations, global trading, and emerging consumer preferences also brings more risk and uncertainty to the collaboration system and makes that this collaboration for the whole ASC sustainability only operate effectively among certain stages.

4 The Case of LEAF: A Sustainable ASC Management Model

LEAF is a leading global charity and membership organization (UK established) whose business model consist of promoting, enabling, assuring and integrating sustainable practices throughout the different stages of the ASC (LEAF 2016).

As aforementioned, the size and complexity of sustainability issues make an integrated sustainable ASC management model to be a challenge. This is why LEAF

has such a crucial role to play. It helps to integrate the whole ASC actors, from 'farm to folk', to deliver a shared vision of sustainability.

4.1 What Does Sustainability Mean for LEAF?

LEAF has a broad view about the "sustainability" term as it implies three basic pillars. First, the economic performance, promoting high productivity with low environmental impact, tangible financial benefits delivered by increased attention to detail, being prepared for future challenges and keeping ahead of legislation. Secondly, the environmental quality, maintaining and enhancing the wildlife value and character of the countryside and landscape, reducing the risk of pollution and environmental degradation, monitoring and demonstrating improvements in the quality of soil, water, air, wildlife habitats and landscape. Finally, the social health, reaching out and connecting with suppliers, customers and the wider agricultural industry, building public understanding, knowledge and trust in farming.

4.2 LEAF ASC

The LEAF ASC is made up of "LEAF Marque" producers, packers, processors, distributors and retailers who are members of LEAF. It is a sustainability assurance certificate system with third independent verification, given to those that meet the LEAF Marque standard requirements (33% of UK fruit and vegetables are LEAF Marque certified and the standard is currently applied on farms in some 36 countries around the world). The LEAF Marque Standard (LEAF 2017) is a list of questions about how it is farmed and how it is managed. For each question there is a control point that must be required to meet in order to qualify for LEAF Marque certification. The questions must be applied to the whole farm.

The current LEAF Marque supply chain directory and other industry services are available to genuine buyers and sellers who are committed to buying food grown with care to the environment that is LEAF Marque certified. The supply chain directory gives the opportunity for buyers to purchase LEAF Marque certified product and promote this to their customers.

4.3 LEAF Sustainable ASC Management Model

LEAF main customers are the farms. Its sustainable ASC management model is primarily based on promoting, enabling and assuring that farmers produce in a sustainable manner. This is achieved by the adoption of Integrated Farm Management (IFM). Those ones meeting the specific requirements within the LEAF Marque stan-

Fig. 1 LEAF integrated farm management (IFM) model

dard, are given the sustainable assurance certificate following independent, third party inspection from an approved certification body, thus recognizing and rewarding these farming practices. LEAF management model focuses not only upstream on producers (in spite of being the most important ones) but also downstream on the different stakeholders throughout the ASC such as processors, retailers and finally the consumers. Some others stakeholders are also considered such as producers groups, government bodies, the scientific community, machinery manufacturers, environmental groups and all other interested businesses. This holistic view by focusing in the different stakeholders, as well as their integration and traceability, aims to achieve the sustainability of the ASC as a whole.

In order to better understand how LEAF interacts with its different customers and which type of services are offered to them is important to know what is the core of its "sustainable ASC management model". Such a core is based on its "Integrated Farm Management (IFM)" model.

4.3.1 IFM Model

IFM is a whole farm business approach that delivers more sustainable farming. IFM uses the best of modern technology and traditional methods to deliver prosperous farming that enriches the environment and engages local communities. LEAF's IFM is made up of 9 sections, shown in Fig. 1, addressing the entire farm business. An appreciation of the importance of each section and the integration between them is essential for its effective implementation.

4.3.2 LEAF ASC Services

Once the LEAF's IFM core business model has been described, in Table 1 a wide range of services offered for all its stakeholders are shown.

4.3.3 Linking IFM and ASC Management: LEAF Marque Chain of Custody

LEAF Marque Chain of Custody system is a *key aspect* in the "LEAF sustainable ASC management model". It is a mechanism for tracking LEAF Marque certified product from certified farms to the final consumer product. It is aimed to ensure that the credibility, transparency and integrity of all LEAF Marque supply chains are maintained which will help everybody to trust the LEAF Marque logo and any claims made. The acquisition of a LEAF Marque Chain of Custody certificate demonstrates the sustainability commitments of businesses. It provides companies with a commercial advantage as it allows them to use the LEAF Marque logo on products, with the aforementioned advantages.

It is an essential part of the LEAF Marque assurance system, it will ensure that the use of the LEAF Marque logo and marketing claims about products originating from LEAF Marque certified farms are credible and verifiable throughout the whole supply chain. It is used to approve and verify sites all along the food and agricultural products value chain. The system works at product level and tracks movement from site to site.

5 Conclusions

This paper highlights the increasing awareness about sustainability. Although economic issues still prevails, environmental and social ones are becoming not just a competitive advantage but also an imperative. Additionally, it is becoming an imperative to set procedures for the sustainability of the whole ASC. In this sense, the research outlines that it is not an easy task since a strong collaboration among all the stakeholders is required, and not only dyadic relationships. Besides, sustainability must be seen in its broadest view, considering not only economic and environmental issues, but also social ones and assuming their interdependences.

Table 1 LEAF ASC Services

LEAF ASC services	Service description	Customer target
Integrated Farm Management: A guide	Booklet for members which goes through the key principles of each section of IFM and the benefits of following an integrated approach	Farmers
LEAF Sustainable Farming Review	Self-assessment on-line management tool, based on IFM, to help farmer members monitor their performance, identify strengths/weaknesses and set targets for future improvements	Farmers
LEAF Marque	Assurance scheme recognizing produce that have been grown lo LEAF's IFM principles. Investment in the LEAF Marque certification enables to demonstrate the environmental commitment and provides a genuine commercial advantage in the demanding premium and assured food market	Farmers, processors, retailers
Integrated Farm Management Bulletin	Electronic update sent to LEAF members several times a year and includes articles from LEAF's Demonstration Farmers, LEAF Innovation Centres and corporate members about cutting edge research and practices going on in IFM at the moment	Stakeholders except final consumers
Information Centre	LEAF's Online library of IFM information	Farmers
LEAF Demonstration Farms	There are 38 working farmers throughout the UK committed to the sustainable farming practices of IFM. They demonstrate best practice IFM through farm walks, talks and demonstrations	Stakeholders
LEAF Innovation Centres	There are 9 research sites throughout the UK developing new approaches to push forward the boundaries of IFM	Stakeholders except final consumers
Open Farm Sunday and Open Farm School Days	Events held in farms and managed by LEAF to engage the public in sustainable food/farming	Stakeholders, mainly consumers

Finally, all the previous outlines have been used as a benchmark to describe the case of LEAF and how it manages the interactions demanded in the delivery of more sustainable systems promoting, enabling, assuring and integrating sustainable practices throughout the ASC.

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