



Enablers to implement sustainable initiatives in agri-food supply chains

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ARTICLE INFO

Keywords:

Agri-food supply chain
Sustainable initiatives
Enablers
ISM-MICMAC
Fuzzy DEMATEL
India

ABSTRACT

Due to rapid agricultural industrialization, increased global food demand, and, increasing concerns related to food quality and safety, the concepts of sustainability and supply chain transparency are becoming critically important to the agriculture and agri-food sector. The new focus on sustainability performance objectives emphasizes the effective utilization and consumption of natural resources to balance ecological, economic and societal aspects of agri-food businesses. The management of sustainability adds a new demand on business managers who often have small profits and receive stringent requirements from large powerful customers and retailers. In this paper, we recognize and analyze the key enablers in implementing sustainable initiatives for Agri-Food Supply Chains (A-FSCs). Ten important sustainability driven enablers were considered from a rigorous literature review and phase of expert consultation. The identified enablers were then analyzed using a combined Interpretive Structural Modeling (ISM) - fuzzy Decision Making Trial and Evaluation Laboratory (DEMATEL) based framework. The ISM approach enabled an appreciation of the contextual relationships among the enablers and to classify the enablers based on their driving and dependence potential. The fuzzy DEMATEL technique supported the determination of the influential and influenced enablers and also to categorize them into cause and effect groups. An empirical case study, drawn from a vegetable and fruit retail supply chain in India, is used to focus and test the applicability of the proposed research framework. The paper facilitates professional management practice and researchers to uncover and explore the enablers for the real execution of sustainability oriented initiatives in the agri-food business sector.

1. Introduction

A remarkable increase in food standards requirements, rapid industrialization of agricultural based products and establishment of customer and governmental food safety concerns have resulted in the agri-food and agriculture based products supply chain networks becoming more complex (Chen, 2006; Lowe et al., 2008; Svensson and Wagner, 2012). These complex agri-food supply chains (A-FSCs) environment have heightened concerns between nations, such as food safety scares and the unsustainable depletion of natural resources etc. (Food Ethics Council, 2004; Sharma, 2011). From the A-FSCs perspective, agriculture is a significant national resource and large employer. Thus, a systems perspective must be undertaken to appreciate the complexities and holistic properties of each (and the interconnected)

value chains both vertically - such as farming, wholesaling, warehousing, processing, and retailing (Dev et al., 2014) - as well as lateral activities where common organizations support multiple value chains. Appropriate implementation of improvement activities may lead to an increase in efficiency and have a continuous improvement in overall performance of A-FSC, organizations. The improvement to the economic benefits, societal considerations, competitive advantages, ecological impacts, are therefore significant for national prosperity (Fritz and Schiefer, 2008; Fischer et al., 2010; Kumar et al., 2013). In addition, increased globalization and growing world population have a huge impact on the sustainability of supply chains, especially within the food industry. The processes in the food value chains are generally characterized by mass production and involve interlinked marketing, procurement, and distribution activities of international standards. The

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<https://doi.org/10.1016/j.ijpe.2018.07.012>

Received 20 April 2017; Received in revised form 13 April 2018; Accepted 11 July 2018

0925-5273/ © 2018 Published by Elsevier B.V.

way food is produced, processed, transported, and consumed has a great impact on sustainability throughout the supply chain. Such food value chains aim to deliver an objective of higher customer satisfaction with marginal food wastage (Beske et al., 2014). In food industry, higher product quality and efficient value chain design are considered as very important concerns for any nation's economy (Bourlakis and Weightman, 2008; Zanoni and Zavanella, 2012; Ting et al., 2014; Govindan, 2018). Due to the complexity that persists in coordinating the members of food supply chain, food wastage has increased significantly (Govindan, 2018). There is an increasing consciousness in society that the waste of perishable foods involves a loss of huge natural resources and should be avoided (Li et al., 2014; Sgarbossa and Russo, 2017). In addition, food security and safety are also very crucial issues in developing economies (Gustavsson et al., 2015). To develop a sustainable agro value chain has been constantly a global challenge in the industry. It is estimated that million people in India are being “fed with grain by over-pumping” of water. India is the second largest food producer country in the world. Agri-food sector contributes 35% in the GDP (gross domestic product) and almost two-thirds of the population in India is connected with agriculture for their source of income. However, in a developing economy like India, the wastage of grain due to the improper management of food supply chain alone is worth \$1 billion annually (Anupam, 2017; Grant Thornton, 2014). Every aspect of the economy, polity, and majority of its population are governed by the performance of the agricultural sector (Somasekhkar et al., 2014). Poor management of supply chain functions and limited integration of innovations (process and technological) in business are the major contributors to this wastage (Balaji and Arshinder, 2016). In addition to this, food value chains also have to deal with several other challenges, such as climate change, consumer pattern, oil reliance, fair trade and localism, social and environmental concerns etc. (Li et al., 2014; Grimm et al., 2014). In order to meet the requirements of healthy and safe food, managers and policy makers need to develop highly sustainable food value chains (Lundqvist et al., 2008; Zanoni and Zavanella, 2012; Sgarbossa and Russo, 2017). To deal with these global issues, the concept of “sustainability” has an impact on the agriculture and agro or agri-food sector (from here onwards the words agro and agri will be used interchangeably), as it focuses upon the consumption of resources in a most effective way (WCED, 1987). Several key driving forces/enablers can influence the implementation of sustainability improvement programs for an organization's supply chain views. These include the managerial approach, government policies, awareness of customers etc. (Kumar et al., 2016) and these have significant impact on deployment and adoption in A-FSCs (Glover et al., 2014). In this sense, an academic gap exists in identifying and analyzing these enablers for real execution of sustainability concepts in A-FSCs (Fritz and Schiefer, 2008; Grimm et al., 2014).

Banasik et al. (2017) suggested that various decision support tools are needed to evaluating various factors to redesign an agro-food chain that can optimize decision making at chain level. Identifying and analyzing these facets will support business organizations to evaluate suitable strategies for managing agro-food sector sustainability, translating strategy into improvements in their economic, ecological, and social responsibilities. Understanding the contextual relationships between these enablers will help the manufacturers in effectively utilizing their resources and attaining sustainable initiatives in A-FSCs. A substantial amount of research has been focused on examining factors that are critical in implementing sustainable initiatives in supply chains from various perspectives (Ageron et al., 2012; Grimm et al., 2014; Raut et al., 2017; Luthra et al., 2018). To date, little attention has been devoted to enablers for effective adoption of sustainability initiatives in A-FSCs as a whole (from the system perspective). This research tries to answer the three main questions:

RQ1. What are the key enablers to implement the sustainable initiatives in A-FSCs?

RQ2a. What are the contextual relationships between the recognized enablers in response to sustainable initiatives in A-FSCs?

RQ2b. What are hierarchical levels of key enablers to execute the sustainable initiatives in A-FSCs?

RQ3. How can these key enablers be organized into cause and effect groups to implement sustainable initiatives in A-FSCs?

A-FSC sustainability focused enablers can be selected through the literature and experts' feedback even though organizations will have their local and contingent priorities/viewpoints on adopting sustainability. In this sense, the researchers selected a portfolio of feasible and commonly cited enablers and subsequently evaluated their impact on improving the effective sustainability of A-FSCs. Hence, this research set an ultimate objective of identifying and analyzing the enablers for their contextual relationships and cause and effect groups to implement sustainable initiatives in A-FSCs. The researchers used a systematic literature review in conjunction with experts' feedback to detect the sustainability focused key enablers. The problem undertaken in this work is of the multi-criteria decision type and thus, a combined Interpretive Structural Modeling (ISM) - fuzzy Decision Making Trial and Evaluation Laboratory (DEMATEL) based approach was designed and used as an appropriate methodology (Mehregan et al., 2014). The impact of this research is a novel insight into a contemporary phenomenon and a combined ISM and fuzzy DEMATEL approach to select and evaluate the sustainability focused enablers in A-FSCs (a methodological contribution). ISM assists in analyzing the contextual relationships between the identified enablers, and establishes hierarchical levels as well as relationships between enablers (Mangla et al., 2013). In addition, fuzzy DEMATEL helps to categorize the identified enablers into cause and effect groups (Luthra et al., 2016a). The fuzzy concepts that are used with DEMATEL capture the human bias and uncertainty in the data.

The applicability of the combined ISM - fuzzy DEMATEL approach was applied to an agriculture based vegetable and fruit retail supply chain case study in India (See Eisenhardt, 1989). The case company has a formal objective to improve its ecological, cost-effective and public performances and to commit to sustainable development initiatives (from the system perspective). The case organization was also interested in creating a structural model to uncover the enablers of sustainability implementation in the supply chain.

The remainder of this paper is organized as follows. The review of related literature and proposed sustainability focused key enablers in A-FSCs is discussed in Section 2. Section 3 discusses the research methods. Section 4 describes the proposed framework for this research. The problem definition and an application example of the proposed framework to the case company are presented in Section 5. Results along with the implications to management are discussed in Section 6. Finally, Section 7 provides conclusions, limitations and the scope for future research.

2. Literature review

This section contains the literature on A-FSC and sustainability to identify key enablers to sustainable initiative implementation by A-FSCs.

2.1. A-FSC and sustainability

The term “agri-food” concerns the business of producing food agriculturally and A-FSC consists of all the activities, which are involved in the movement of agricultural food produce from the producers/farmers to customers. The important activities in an A-FSC include raw material supply, manufacturing, postharvest, storage, distribution, services, etc. (Ahumada and Villalobos, 2009; Jaffee and Howard, 2010; Kumari et al., 2015). In recent years, the concept of sustainability

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