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Impact of agri-fresh food supply chain quality practices on organizational sustainability

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Abstract

The aim of this paper is to present empirical evidence about the relationship between Agri-fresh Food Supply Chain Quality (AFSCQ) practices and Organizational Sustainability (OS) outcomes. Organizational Sustainability embraces economic, environment and social sustainability. Based on literature review, a set of AFSCQ practices has been identified to create a theoretical model and to setup their relationship to OS as Economic Sustainability (ECS), Social Sustainability (SOS) and Environmental Sustainability (ENS). The measurement scales of AFSCQ practices and measures of OS were established in four stages: initial instrument development; structured interviews and utilization of Q-sort method; wide-ranging data collection by survey questionnaire; and analysis to confirm reliability and validity. Finally, Structural Equation Modeling (SEM) was utilized to validate the model with survey data collected from Indian agri-fresh food industry. The study developed relationships between AFSCQ and OS. Specifically, Customer Focus (CF) and Supplier Management(SM), both have direct and indirect influence on OS while Top Management Leadership and Commitment to AFSCQ, Internal Management(IM) and Supply Chain Integration Management using IT(SCIMIT) have indirect and direct influences on OS, respectively. The results also show that AFSCQ practices should be executed as an integrated coordination instead of independent practices, wherein they co-operate with each other and enrich OS. The empirical outcomes of this paper give evidence to count the AFSCQ as a reliable medium for OS. The AFSCQ practices are favorable to develop organizational sustainability, and then improve economic, social and environmental performance indirectly. The suggested model establishes the relationship between AFSCQ and OS. Additionally, the model's justification to utilize the Indian agri-fresh food industry gave significant insights both from theoretic and realistic perspectives.

Keywords Agri-fresh Food Supply Chain Quality (AFSCQ) · Organizational Sustainability (OS) · Supply Chain Management · Structural Equation Modeling

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1 Introduction

As the competition in global markets increased, supply chain management has a center position by means of responding quickly, accurately, and valuably to market necessities. This is a general tactic supporting the "thinking by which organizations can run inter-organizationally in order to attain business excellence" (Robinson and Malhotra 2005). A Supply Chain Management (SCM) system includes numerous subsystems, comprising of forecasting, order management, supplier management, warehousing and distribution, production planning and control, procurement, and product advancement (Hendricks and Singhal 2014). The conception of supply chain management has developed from two distinct paths: first is purchasing and supply management, second, transportation and logistics management (Li et al. 2006). According to Lambert (2017), Supply Chain Management is the management of multiple relationships across the supply chain. Supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served (Hugos 2018). Quality management is generally not taken into account as a considerable dimension of supply chain management (Robinson and Malhotra 2005).

Quality management has been implemented extensively by numerous organizations as an attempt to attain competitive advantage. However, research in quality management has been criticized for concentrating excessively on the internal vision of quality (Foster Jr 2008). The implementation of the system approach inherent in supply chain management requires externalizing the vision of quality enhancement by concentrating on customers and advancing suppliers (Foster Jr et al. 2011).

A combination of supply chain management and quality management can be seen within research as supply chain quality management (Sila et al. 2006). Mellat-Parast (2013) discussed that supply chain quality is a distinct group of practices that gives emphasis to continuous process development or improvement among stakeholders in the supply chain in order to enrich performance and attain customer satisfaction during eminence in learning. These explanations are restricted to services and manufactured products and little consideration is given to perishable food products. Perishable products comprise a larger portion of the world economy and are the source of resources for numerous industries (Siddh et al. 2015). An et al. (2015) also indicated that the agricultural segment performs a notable function in developing economies, even though a larger number of farmers are trapped in the poverty cycle owing to their small holdings. Singh (2014) stated that the agriculture sector plays a very crucial role in the economic growth of India. For sustaining its further growth, the agriculture sector's supply chain must be strengthened. It was also reported in the literature that about 30–35 percent of all the food produced is wasted or spoiled (wherein India or other countries in the world, has to be mentioned) due to lack of efficient infrastructure and an inefficient food processing industry (Parwez 2014). Spoiled food is an enormous waste issue and contributes to greenhouse gas emissions. Unsafe food is an immense public health problem and leads to sickness and sometimes death. Postharvest loss, food safety and quality, and perishability are found to be the major issues for agri-fresh food segment. Kalia and Parshad (2015) stated that better economic revenues by food growers and retailers can only be harnessed if the huge post-harvest losses could be decreased through improved handling systems (packaging and cold chain maintenance) to assure quality and safety in the supply chain of food products.

Siddh et al. (2015) also described that research toward "agri-food" or perishable products is dominant in India. Siddh et al. (2017) stated that "agri-fresh foods" are more perishable in the area "agri-food" sector. The supply chain quality of "agri-fresh food" products, herein after concerned with Agri-fresh Food Supply Chain Quality (AFSCQ) comprises the process and product quality from farm to consumers of products. The AFSCQ is multifaceted due to the perishable nature of the food products, high-level of insecurity in demand and cost, raised consumer concern for food safety (van der Vorst and Beulens 2002), and reliance on climate circumstances (Salin 1998). Siddh et al. (2017) also discussed that AFSCQ shows a group of systematized practices that emphasize development of continuous process improvement among supply chain partners in order to enrich organizational sustainable performance. Distinct from traditional or usual performance measures, not only sales and return, etc., Organizational Sustainability (OS) comprises of economic, social and environmental sustainability. Mangla et al. (2018) stated that the organizational sustainability emphasizes the effective utilization and consumption of natural resources to balance ecological, societal and economic outlooks of the agri-food businesses. Khan et al. (2020a, b) stated that the focus towards sustainability has grown significantly in the supply chain field. Yu and Khan (2021) addressed the awareness of the significance of agricultural sustainability. The aim of this paper is to deliver empirical evidence about the relationship between practices of AFSCQ and OS in select Indian agri-fresh food industries.

Data for this research study was collected from 369 survey participants from the Indian agri-fresh food industry. The research framework is examined by the utilization of Structural Equation Modeling (SEM). Khan et al. (2021a, b) also analyzed the responses through structural equation modeling to study organizational sustainability. Also, it is

expected that AFSCQ practices, concurrently from upstream side, internal and downstream side aspects of agri-fresh food supply chain, will help develop the insight to the scope with regard to AFSCQ and the relationship among the practices of AFSCQ. Further, the empirical evidence pertaining to the influence of AFSCQ on OS would be valuable to supply chain members by proposing advantageous direction for integrating quality inventiveness into the supply chain. The implementation of AFSCQ practices in Indian agri-fresh food industry is likely to make a significant contribution to organizational sustainability.

The content of this research paper is organized as follows. Theoretical background and proposed research model of the relationship between AFSCQ practices and OS measures is reported in the next section. Research methodology is discussed in Sect. 3. The empirical investigation of the proposed research model along with related hypotheses in select Indian agri-fresh food industry are presented in Sect. 4. Section 5 discusses results of analysis as well as managerial and research implications. Section 6 presents the conclusion of the study. Lastly in Sect. 7, limitations and future research directions are included.

2 Theoretical background and proposed research model

The agri-fresh food supply chain is extremely complicated due to the short shelf life of the agri-fresh food products, the excessive amount of demand and cost uncertainty, and the rising consciousness of consumers in the direction of food safety (Van der Vorst and Beulens 2002). Agri-fresh food supply chains are also highly influenced by unpredictability of climatic circumstances (Salin 1998). Siddh et al. (2015) reviewed literature on perishable food supply chain quality (PFSCQ) and stated that agri-fresh food supply chain is also one of the highly perishable food supply chains caused by short shelf life of agri-fresh food products and unpredictability of climate conditions. Siddh et al. (2017) also reviewed literature on Agri-fresh Food Supply Chain Quality (AFSCQ) and stated that AFSCQ shows a group of organized or systematized practices showcasing top management's leadership and commitment to AFSCQ, supplier management, customer focus, process quality or process control, supply chain integration using IT, logistics management etc. with emphasis on advancement of continuous process improvement among supply chain partners in order to enrich organizational sustainability. Organizational sustainability covers economic, environment and social sustainability.

The study of Romano and Vinelli (2001) compares quality practices in two dissimilar types of supply networks, of which Marzotto is the focal firm. One is managed the traditional way with customer–supplier attitude with no proper integration. The other, includes participation of upstream side and downstream side partners in broader and additionally coordinated ways. It was found that the supply chain, which has coordination or integration among supply chain partners, can meet customer satisfaction. Hence, a fruitful execution of AFSCQ necessities is needed to integrate the supplier management, internal management as internal process quality or process control, and customer focus practices. Further, for this effective integration of supplier, customer and internal processes, information performs a very important role (Beulens et al. 2005; Ketzenberg and Ferguson 2008; Bosona and Gebresenbet 2011; Siddh et al. 2015). Ketzenberg et al. (2014) focused on the significance of time and temperature information to handle perishables from the perspective of a retailer. Khunti et al. (2018) stated that Information Technology (IT) can perform a vital role in handling operations to assist environmentally sustainable development. Siddh et al. (2017) presented a comprehensive literature review on AFSCQ, which also highlighted that effective integration can be achieved by using better ways of communicating information among supply chain partners. Nakandala et al. (2017), also discussed that frequent information flow is essential for quality integration among fresh food supply chain partners. Deficiency in information from one end to the other end of the supply chain, can initiate considerable difficulties, like unnecessary investment in inventory, lost revenues, inadequate customer service, ineffectual transportation and lacked production plans etc. Han et al. (2013) concentrated on inventory supply as a main element of a firm's global supply chain, and linking inventory supply with firm financial performance. Chen and Pundoor (2009) examined an integrated production–distribution scheduling model where the orders usually fluctuate in size and the delivery batch capability is finite.

Earlier studies are generally paying attention to the direct relationships, hence there is a lack of investigating relationships among AFSCQ practices. According to Siddh et al. (2017), it is not all-inclusive if a research model does not point out the relationship among AFSCQ practices. Further research studies are needed to make out the direct and indirect influence of AFSCQ practices on OS at numerous stages.

With regard to organizational performance, it is well-defined as to how an organization attains its market objectives, and also its inclusive targets. For the time being, past research models examine the relationships between agri-fresh food supply chain practices and financial measures, including selected dimensions of organizational performance. These selected dimensions for measuring organizational performance tend to be historic and do not explain the recent business world, as well as expose views of OS. Siddh et al. (2017) reviewed literature on AFSCQ and focused on OS, which includes economic, social and environmental sustainability.

In summary, further research is required to recognize the direct and indirect influence of AFSCQ practices on OS at multiple levels. There are certain research gaps that lessen the significance of earlier studies in literature. Those are: discrepancies in results of earlier studies; the mutual relationship among AFSCQ practices has not been investigated; and data analysis method. This research study fulfills the above research gaps by proposing a novel framework based on Structural Equation Modeling (SEM) and justifies this model by the data collected from the selected Indian industries related to agri-fresh food as fruits and vegetables.

The following research gaps have been identified in the earlier literature on AFSCQ. (i) The absence of a model or framework that comprises Supplier Management (SM), Internal Management (IM) and Customer Focus (CF) of Agri-fresh food supply chain to improve Organizational Sustainability (OS). (ii) Supply Chain Integration Management using IT (SCIMIT) among supply chain stakeholders or partners is not thoroughly considered. (iii) Numerous aspects of Organizational Sustainability (OS) are not assessed simultaneously.

Various practices of AFSCQ in addition to measures of OS were identified from extensive literature review. Generally, the financial measures were assessed in terms of organizational sustainability. Kaplan and Norton (1992) reported numerous perceptions of performance measurements as, financial customer satisfaction, invention, internal processes, etc. Siddh et al. (2017) reviewed extensive literature on AFSCQ and stated that OS is completely accomplished by economic sustainability in addition to social and environmental sustainability.

Afterwards, structured interviews were arranged with academicians as well as area professionals. The conversations of academicians and area professionals were recorded and analyzed before carrying out any specific advancement in the research framework. The designated higher rank managers are requested to review the research framework to enhance the quality. From the feedback of the managers, the research conceptions were amended and used in building the concluding research models. These participants in the structured interviews were not included in responding to the survey questionnaire.

Therefore, by linking with a wide literature review, a set of significant AFSCQ practices and organizational sustainability has been classified as: Top Management Leadership and Commitment to AFSCQ (TMLC_AFSCQ), Internal Management (IM) as internal process quality or process control and logistics management, Supply Chain Integration Management using IT (SCIMIT), Supplier Management (SM), Customer Focus (CF) and Organizational Sustainability (OS) including Economic Sustainability (ECS), Social Sustainability (SOS) and Environmental Sustainability (ENS). Table 1 shows the categorization of Agri-fresh Food Supply Chain Quality (AFSCQ) Practices /Constructs and Organizational Sustainability (OS) measures and also major relevant research studies where these practices and measures were highlighted.

2.1 Top management leadership and commitment to AFSCQ (TMLC_AFSCQ)

In healthier implementation of AFSCQ practices, TMLC_AFSCQ has a crucial role (Banterle et al. 2014). To attain organizational sustainability, the top management, as well as employees, must address known essentials. Moreover, the participation of customers by top management in organizational activities plays an important role for the overall organizational sustainability as well as the supply chain. The TMLC_AFSCQ showcased their mission and vision of the organization and created an environment for every member in it, to increase their concentration and focus on user fulfillment (Ahire and Raichandran 2001).

The TMLC_AFSCQ also focused on supplier management that values quality of the supplier. Rimmington et al. (2006) denoted that supplier management provokes betterment of raw food and achieving environmental sustainability. Soler et al. (2010) discussed that the implementation of TMLC_AFSCQ is fruitful for an organization. Ellram (1995) also stated that top management considered supplier quality as the key measure for ratifying improved potencies of integration. The top management also has a significant role in information sharing among supply chain partners to maintain supply chain integration (Zeng et al. 2013). The top management conducted the employees' development programs to enhance skills, as well as knowledge of employees. The development of employees plays a vital role in sustaining a business organization. Akhtar et al. (2016) stated that the leadership also performs an important role for financial sustainability. Siddh et al. (2018a) also discussed that human resources management is optimistically impacted by top management. Mokhtar et al. (2019) reviewed literature on supply chain leadership and stated that supply chain performance is impacted by supply chain leadership.

Furthermore, the important function of top management is to govern the internal management of an organization to sustain organizational sustainability. Internal management mainly focuses on Process Management (PM) as well as logistics management. The AFSCQ is mainly related to internal management of supply chain, which is focused on by top management (Siddh et al. 2017). Henceforth, the following hypothesis is suggested.

Table 1 Agri-fresh Food Supply Chain Quality (AFSCQ) Practices and Organizational Sustainability (OS) measures

Constructs/Measures	Description	Relevant Research Studies
Top Management Leadership and Commitment to AFSCQ (TMLC_AFSCQ)	Top management plays an important role in the overall organizational sustainability as well as the supply chain quality	(Ahire and Raichandran 2001; Soler et al. 2010; Foster Jr et al. 2011; Zeng et al. 2013; Banterle et al. 2014; Siddh et al. 2015; Mokhtar et al. 2019)
Customer Focus (CF)	Customer focus is mainly related to fulfill the customers' all essential needs in terms of the delivery of healthier products	(Aghazadeh 2004; Lakhal et al. 2006; Joshi et al. 2009; Fritz and Schiefer 2009; Ali et al. 2010; Siddh et al. 2015; Mutonyi et al. 2016)
Supplier Management (SM)	The raw food quality of the supplier meets the process and product quality standards of an organization	(Manning et al. 2006; Kaynak and Hartley 2008; Jan Hofstede et al. 2010; Liu et al. 2013; Aggarwal and Srivastava 2016; Siddh et al. 2017)
Supply Chain Integration Management using IT (SCIMIT)	Supply chain integration among partners by the utilization of Information Technology improves the effectiveness of an organization. Integrating organizations with suppliers and customers will lead to achieving organizational sustainability in terms of process, product, and service quality	(Samuel and Hines 1999; Ulwick 2005; Beulens et al. 2005; Pieter van Donk et al. 2008; Alfaro and Rábade 2009; Rajaguru and Matanda 2009; Bosona and Gebresenbet 2011; Khuntia et al. 2018; Singh et al. 2019; Corallo et al. 2020)
Internal Management (IM)	Internal management consists of food processing and logistics management. The utilization of appropriate food processing technology, boosting the automation as well as maintaining quality standards. The facility location and inventory management is assessed by logistics management	(Van der Vorst and Beulens 2002; Gong et al. 2007; Rong et al. 2011; Lazaridesa 2011; Grant et al. 2013; Jie et al. 2013; Azoury and Miyaoka 2013; Siddh et al. 2015; Adeyeye 2017)
Economic Sustainability (ECS)	Sustain economic progress by way of superior economic returns with environmental quality, and social coherence	(Lazaridesa 2011; Yakovleva et al. 2012; Gold et al. 2013; Kronborg Jensen et al. 2013; Yu et al. 2014; Siddh et al. 2014; Banterle et al. 2014; Reardon and Timmer 2014; Schaltegger and Burritt 2014; Touboulic, and Walker 2015; Wilkinson 2015; Tajbakhsh and Hassini 2015; Voldrich et al. 2017; Govindan 2018; Kamble et al. 2020; Khan et al. 2020a; b)
Social Sustainability (SOS)	Supply chain social sustainability refers to the approaches firms take to address product and process aspects of the supply chain that affect the safety, health, and welfare of people associated with the supply chain	(Rimmington et al. 2006; Lazaridesa 2011; Yakovleva et al. 2012; Gold et al. 2013; Kronborg Jensen et al. 2013; Schaltegger and Burritt 2014; Li et al. 2014; Yu et al. 2014; Tajbakhsh and Hassini 2015; Touboulic, and Walker 2015; Wilkinson 2015; Govindan 2018; Khan et al. 2019a; Mani et al. 2020;Kamble et al. 2020)
Environmental Sustainability (ENS)	Building environmentally friendly decisions, for instance saving raw materials, using by-products as well as decreasing waste	(Lazaridesa 2011; Yakovleva et al. 2012; Kronborg Jensen et al. 2013; Gold et al. 2013; Li et al. 2014; Yu et al. 2014; Schaltegger and Burritt 2014; Touboulic, and Walker 2015; Tajbakhsh and Hassini 2015; Wilkinson 2015; Khan et al. 2018; Govindan 2018; Khan et al. 2019b; Zhang et al. 2020; Khan et al. 2020a, b;Kamble et al. 2020; Khan and Yu 2020)

H1. TMLC_AFSCQ has a positive impact on AFSCQ.

2.2 Customer focus (CF)

The Customer Focus (CF) is one of the key practices of AFSCQ to attain organizational sustainability. It is mainly related to fulfill the customers' all essentials in terms of the delivery of healthier products. The vision and mission of the department should focus on customer focus as well as communication among employees of an organization (Aghazadeh 2004; Joshi et al. 2009). Customers are extensively pointing their concern for freshness, as well as hygienic, satisfactory price and non-seasonal availability of food products (Ali et al. 2010). Mutonyi et al. (2016) also discussed the price satisfaction aspect of food products in terms of customer satisfaction. Lakhal et al. (2006) discussed numerous practices of customer focus that grasp customer wants as well as market openings, so organizations can renovate their working environment according to customer wants. Thus, Customer Focus (CF) positively impacts AFSCQ. Henceforth, following hypothesis is suggested.

H2. CF has a positive impact on AFSCQ.

2.3 Supplier management (SM)

The Supplier Management (SM) is also one of the key practices to sustain AFSCQ in terms of organizational sustainability. The raw food quality of the supplier meets the process and product quality standards of an organization (Manning et al. 2006; Kaynak and Hartley 2008). One of the valuable aspects is that the efficient management of suppliers will possibly maintain inventory, as well as sustain environmentally friendly aspirations (Rimmington et al. 2006). Henceforth, following hypothesis is suggested.

H3. SM has a positive impact on AFSCQ.

2.4 Supply chain integration management using IT (SCIMIT)

The integration among supply chain partners has a vital role to sustaining AFSCQ. Samuel and Hines (1999) discussed that supply chain integration among partners by the utilization of Information Technology improves the effectiveness of internal management of an organization. According to Ulwick (2005) that integration of organization with suppliers and customers will lead to achieving organizational sustainability in terms of process, product, and service quality.

In the modern era, Information Technology holds a crucial function in the integration of supply chain as sharing of data within partners of supply chain helps to cut waste by an exponential factor as well as keeping organizational sustainability. The communication of information among supply chain stakeholders results in effective functioning of either single or distinct entities. Having both entities effectively functioning jointly can derive the desires of the user, and can respond quickly to corresponding market factors. Kamble et al. (2020) also discussed about the achieving sustainable performance in a data-driven agriculture supply Chain. Henceforth, following hypotheses is suggested.

H4. SCIMIT has a positive impact on AFSCQ.

2.5 Internal management (IM)

Food processing as well as logistics management are generally considered internal management for an organization. The use of relevant food processing technology, boosting the automation in the production system and maintaining standards of quality are the key functions of food processing management in an organization (Jie et al. 2013). The scientific contributions during food processing also have a significant role in managing the food security challenges (Adeyeye 2017). Azoury and Miyaoka (2013) developed a modeling approach for managing production as well as distribution decisions for processed food supply chains.

Logistics management is another important aspect of internal management. According to Gong et al. (2007), the facility location as well as inventory management is considered by logistics management. One of the important aspects is that logistics management can manage the challenges of food product spoilage as well as on-time delivery (Paksoy et al. 2012). Henceforth, following hypothesis is suggested.

H5. IM has a positive impact on AFSCQ.

2.6 Agri-fresh food supply chain quality (AFSCQ)

The AFSCQ has a considerable impact on organizational sustainability throughout the organized practices through the entire food supply chain that covers Supplier Management (SM), Internal Management (IM) and Customer Focus (CF) activities. AFSCQ's impact has not yet been appropriately considered in literature. Selected studies have only emphasized supplier management of the agri-fresh food supply chain (Blundel and Hingley 2001; Ottesen 2006; Hofstede et al. 2010; Liu et al. 2013). Some studies examined the influence of customer focus on performance (Soucie 1997; Chrysochou et al. 2009; Iliopoulos et al. 2012), while others studied the impact of internal management, as internal process quality or process control, and on performance (Pieter van Donk et al. 2008; Taylor 2006; Rajaguru and Matanda 2009; Mergenthaler et al. 2009; Bosona and Gebresenbet 2011; Jack et al. 2014). Selected authors have studied supply chain integration and performance (Reardon and Timmer 2014).

Overall, each study indicated distinctive perceptions about the relationship between AFSCQ practices and OS. The execution of AFSCQ practices includes not only the internal practices of an organization, but also the external practices, which integrates an organization to suppliers and customers (Siddh et al. 2018b).

The implementation of AFSCQ practices has a considerable impact on AFSCQ in terms of organizational sustainability. The organizational sustainability consists of economic, social and environmental sustainability. Siddh et al. (2015) discussed numerous perishable food supply chain quality practices and their impact on sustainable performance of an organization. Mani et al. (2020) explored the social sustainability in the supply chain of the small and medium manufacturing industries. Siddh et al. (2017) reviewed comprehensive literature on Agri-fresh food supply chain quality (AFSCQ) and discussed that AFSCQ practices impact organizational sustainability in terms of economic, social and environmental sustainability as well. Govindan (2018) discussed on sustainable consumption and production in terms economic, social and environmental sustainability with a focus on the food industry. Hong et al. (2019) discussed the impact of supply chain quality management practices and capabilities on operational as well as innovation performance. Figure 1 shows the proposed research model of the relationship between AFSCQ practices and organizational sustainability measures.

Henceforth, following hypotheses are suggested.

H6a. AFSCQ has a positive impact on ECS.

H6b. AFSCQ has a positive impact on ENS.

H6c. AFSCQ has a positive impact on SOS.

3 Research methodology

The flow of empirical research work in this paper is organized according to the stages of empirical research suggested by Flynn et al. (1990). The stages of empirical research are as follow:

Phase 1: Establish the theoretical foundation.

Phase 2: Selection of research design.

Phase 3: Selection of data collection method.

Phase 4: Implementation.

Phase 5: Data analysis.

Phase 6: Findings, discussion and conclusion.

The common research methodology takes on for conducting the empirical investigation is shown in Fig. 2

It was observed in the review of literature that in empirical studies, survey research design is most prevalent. This study involves theory building as well as theory verification. Theory building has already been carried out in Sect. 2, thus now theory verification must be performed. Verification of the relationship between AFSCQ practices and OS will be done using a survey research design.

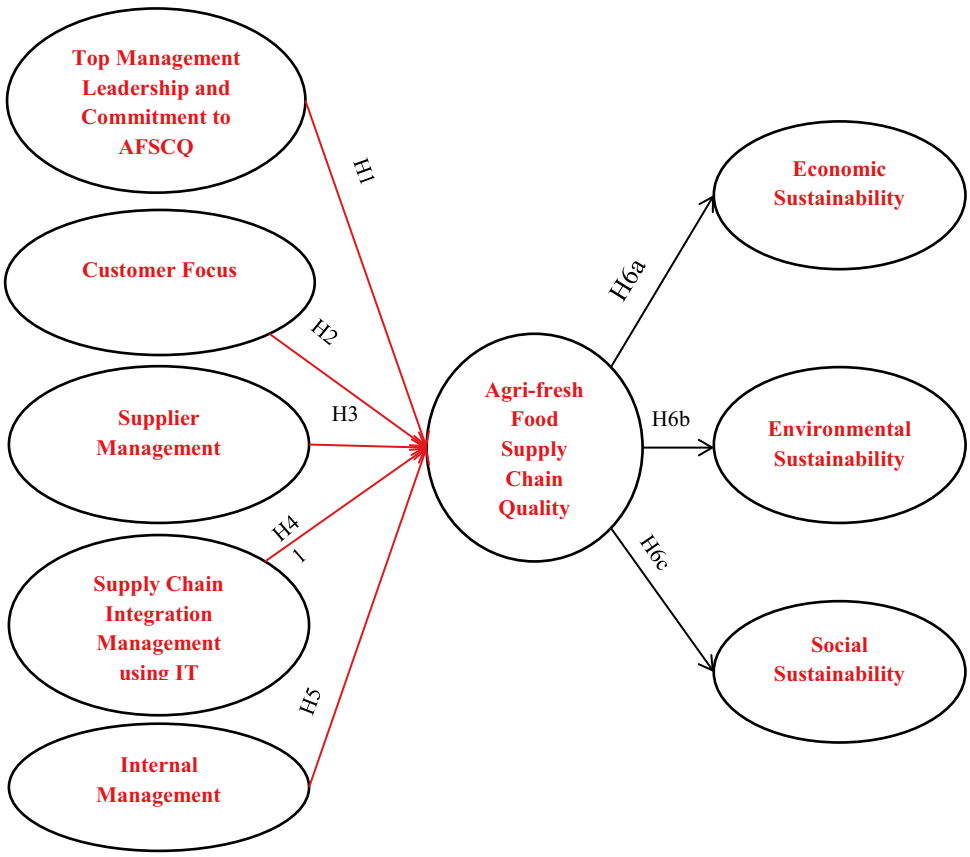

Fig. 1 Proposed research model of the relationship between AFSCQ practices and OS measures

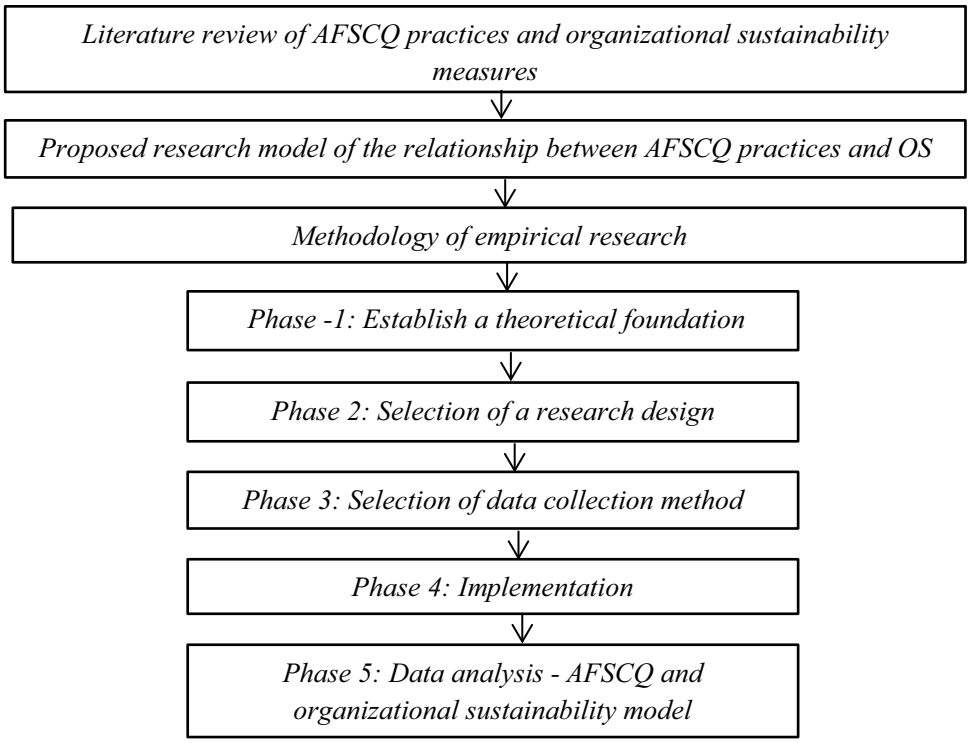

Fig. 2 General research approach

The most commonly used data collection method for survey research design is the use of questionnaires to retrieve the response on the observed variables in the concerned study. Hence, a questionnaire is designed in two parts to achieve the research objectives of the study. Part A of the questionnaire contains questions related to general information of the industry and the respondent such as respondent name, designation, area of work, work experience, and number of employees etc. Part B of the questionnaire contains AFSCQ practices and OS measures. Based on literature, five AFSCQ practices (constructs) and three OS measures were recognized: TMLC_AFSCQ, CF, SM, SCIMIT, IM, ECS, SOS and ENS. The validity and reliability of the survey instrument were strengthened by comprehensive literature review and pilot tests with in-depth managerial interviews in food industries in India. The eight constructs, with their items, are shown in Table 2

The target population in this empirical study is the Indian-based agri-fresh food industries. The target respondents involve CEOs, senior level managers and coordinators who have experience in the field of perishable food supply chains. The survey questionnaire was sent as an attachment in a Microsoft Word document form, along with a cover letter that was sent to the e-mail IDs of 1155 industry CEOs to their e-mail IDs. A considerable number (357) e-mails bounced back. After thirty days, only 21 responses were obtained. A response rate of 2.63% was disappointing. Thus, in order to enhance the response rate, phone calls were made to those that had yet to respond. It was revealed that respondents were not comfortable giving responses via attachments and favored using online forms. Hence, it was decided to post the survey questionnaire online, then by emailing the link of the online survey and saving their responses to a Microsoft Access database. The survey questionnaire link was resent to prospective industry respondents via e-mail (deleting 357 invalid e-mail ID's). Now the response rate increased to 11.46% (with 89 responses). Saxena and Sahay (2000) stated that a response rate of 8% is adequate in Indian surroundings. Ruparathna and Hewage (2015) and Gopal and Thakkar (2016) attain response rates of 10.80% and 16.2%, respectively. The major share of the survey respondents (259) were from offline mode, such as a personnel meeting with senior management during various programs conducted by state, central governments and agriculture related departments, in which India's reputed industries participated. A total of 369 completed survey questionnaires were collected. Table 3 provides the statistics of respondent industries.

It is essential to code the respondents' data prior to performing any inferential statistics. The practice of coding includes the numbering of variables, their levels and values. The coding was performed for all the items of part B of the questionnaire before completing the data analysis.

After coding, data screening was started in which assumptions considered were generally implicit and typical in any statistical analysis. Leech et al. (2005) advised the initial data analysis before any inferential study with the subsequent order: firstly, look at outliers, data pattern distribution, find

Table 2 Descriptive statistics of items of research constructs

Constructs	Code	Items Description	Items Code	Mean	Standard Deviation
Top Management Leadership and Commitment to AFSCQ	TMLC_AFSCQ TMLC_ AFSCQ	Commitment to customer satisfaction	TMLC_AFSCQ 1	4.41	0.653
		Commitment to supplier relationship	TMLC_AFSCQ 2	3.63	0.838
		Effective adoption and execution of innovations, with new programs, technologies, and activities for improvement of processing and logistics conditions	TMLC_AFSCQ 3	4.27	0.748
		Human resource management	TMLC_AFSCQ 4	3.75	0.851
Customer Focus	CF	Brand awareness toward quality of food product	CF1	4.54	0.575
		Emphasis on product variety or diversity	CF2	3.47	0.718
		Frequently communication with customers, like consistent or routine survey of customer's view	CF3	3.72	1.062
		Improve customer's convenience by providing significant information on the packaging of food product	CF4	4.23	0.796
Supplier Management	SM	Quality of supplier's raw food	SM1	3.38	0.661
		Set up long-term relationships with suppliers	SM2	4.21	0.668
		Actively suppliers' engagement in organizational supply chain quality development courses	SM3	3.91	0.836
		Collaboration and coordination along with suppliers for attaining eco-friendly goals	SM4	3.80	0.821
Supply Chain Integration Management using IT	SCIMIT	Technological integration among the entire supply chain activities and processes	SCIMIT1	3.79	0.600
		Unbiased profit distributing among entire supply chain stakeholders to keep lifelong relationship	SCIMIT2	4.24	0.703
		E-commerce (Exchange of data among supply chain stakeholders)	SCIMIT3	4.41	0.641
		Traceability and Tracking of the entire supply chain	SCIMIT4	3.82	0.935
Internal Management	IM	Continuous process improvement for internal process control or improving processing quality and emphasis on research and development related to food processing quality	IM1	3.62	0.681
		Quality standards to make sure assured quality of food product	IM2	4.20	0.753
		Standard conditions for food product storage and transportation	IM3	4.42	0.672
		Inventory management	IM4	4.42	0.715
Economic Sustainability	ECS	To reduce food processing and logistics cost	ECS1	3.95	0.816
		Reduce transaction cost	ECS2	4.17	0.602
		Increase market-share	ECS3	3.56	0.716
		Emphasis on revenues or returns from "green" products and reduce cost of the waste management	ECS4	3.96	0.725
Social Sustainability	SOS	Food product quality like safe, healthy	SOS1	3.85	0.866
		Build up the social welfare schemes. Food product contributions to more population or community	SOS2	3.49	0.684
		Specified working environment	SOS3	3.34	0.706
		Flora and fauna centering framework	SOS4	3.57	0.738
		Diversity or Miscellany of employees	SOS5	4.02	0.834
Environmental Sustainability	ENS	To reduce air emission and effluent discharge	ENS1	3.86	0.811
		Safe and sound dumping of packaging substances	ENS2	3.34	0.920
		To reduce utilization of harmful materials like toxic / antibiotics etc	ENS3	3.82	1.025
		Save ecosystem	ENS4	4.14	0.874

Table 3 Statistics of respondent industries

Type of industry (Sector)	Responses received	Percentage
Manufactured food industry	138	37.40
Conserved food industry	117	31.71
Local or medium/small companies	114	30.89
Region wise industries	Number of industries	Percentage
North	162	43.90
West	97	26.29
South	57	15.45
East	53	14.36
Number of Employees	Respondent industries	Percentage
100 or less	78	21.14
101 to 500	74	20.05
501 to 1000	87	23.58
1001 to 3000	67	18.16
More than 3000	63	17.07
Approximate trend of profits during the last three years	Respondent industries	Percentage
Increase up to 10% per year	52	14.09
Increase more than 10% per year	91	24.66
Almost constant	128	34.69
Decrease up to 10% per year	98	26.56
Total no. of respondent industries = 369		

any missing data; secondly, assess the level to which the assumptions of statistical methods are met; and lastly, analyze the demographic data of the study, which develops the level of comprehension with the research study.

Moreover, missing value analysis process was utilized to detect missing values and forms of missing values in the collected data. It assists to decide in regard to what manner the missing values should be considered. This analysis is utilized casually to assess the missing data and secure a judgment of whether to include the missing values. In collected data, there are no missing values.

In addition, Mahalanobis distance (D2) was used as a measure of the outliers. It is a distance of a specific case from the centroid of outstanding cases. The centroid is a point that is generated by means of all variables. According to Hair et al. (2006), the critical level for measure D2/Df should be less than 3 or 4 in big or large sample sizes. Herein, no evidence was observed of outliers after analyzed by means of SPSS software.

Armstrong and Overton (1977) discussed estimating non-response bias in mail surveys and stated that the non-response bias with t-test analysis was carried out in order to assess the considerable difference in the items between early or without delay and late or later than usual respondents. From this perspective, results revealed that there were no considerable differences in the average scores of all observed items. The outcomes non-response bias test was insignificant for all items at a five percent significance level, therefore, advising that non-response bias was not existent. Hence 369 questionnaires data were utilized for further analysis.

The correlation as well as linear regression analysis was performed by the utilization of SPSS software. Further, the SEM analysis was performed by the utilization of AMOS software. SEM is a multivariate statistical analysis method that is utilized to examine structural relationships. SEM method is the combination of factor analysis and multiple regression analysis, as well as it is utilized to examine the structural relationship concerning measured items and latent constructs. In addition to considering random measurement error, SEM offers researchers added flexibility over a regression approach and gives opportunities for an enhanced analysis (Blanthorne et al. 2006). A SEM comprises of two type models; one is a measurement model, and the other is a structural model. The outcomes from the SEM are given in the subsequent section.

4 Results

In this study, software package for SEM, AMOS was utilized to perform CFA. The Maximum Likelihood (ML) estimation method was applied. This research also displays that ML estimation method can be utilized for data with minor deviations from normality (Wang and Ahmed 2004; Raykov and Widaman 1995).

4.1 Developing the measurement model by using confirmatory factor analysis (CFA)

To attain goodness of fit, it is essential to test reliability and validity of the concerned constructs. In the beginning, reliability of distinctive items is confirmed by assessing reliably loading on their concerned construct at closely or above 0.5 (Fornell and Larcker 1981). Each construct was established by means of considerable standardized loading of items. Table 4 displays the values of estimates (Standardized), R-squared (Squared multiple correlations), CR (Composite Reliability) and AVE (Average Variance Extracted).

Unidimensionality determines the level to which observed items or variables in a scale compute the same or identical construct (Venkatraman 1989). To examine unidimensionality, the value of R-squared is calculated by means of CFA. Table 4 shows that value of R-squared varies from 0.363 to 0.772. Falk and Miller (1992) suggested that R-squared values should be equal to or greater than 0.10 for the variance explained of a distinct endogenous construct to be deemed acceptable. Thus, each construct has goodness of fit, thereby all constructs are unidimensional.

Composite Reliability (CR) is a measure of the overall reliability of a collection of heterogeneous but similar items. Table 4 shows that value of CR and Cronbach's alpha is above 0.7 (Nunnally et al. 1967).

Convergent validity of the measurement model can be assessed by the Average Variance Extracted (AVE). Table 4 shows that, the AVE varies from 0.468886 to 0.581318 for all first order research constructs. While AVE is less than 0.5, composite reliability is greater than 0.6, so the convergent validity of the research construct is still acceptable (Fornell and Larcker 1981).

Discriminant validity indicates the level that dissimilar factors are distinct. As Table 5 presents, the correlation coefficients between AFSCQ practices are less than the reliability coefficients, hence the measures have discriminant validity. Also, square roots of the AVEs, denoted in italics (Table 5) are larger than the off-diagonal constituents in the consistent rows and columns exceeding the correlations between a given construct; this proposes that a construct is more soundly correlated with its indicators than with other constructs in the measurement model. Thus, discriminant validity seems acceptable at the construct level in the instance of entirely constructs. Diagonal in italics shows square root of Average Variance Extracted (AVE); off-diagonal denotes correlations between constructs.

The Goodness of Fit Indices for the five AFSCQ practices (constructs) was under a tolerable range which was considered for further analysis.

4.2 Structural equation model

In order to evaluate the AFSCQ practices and OS relationship, it was essential to set up a second-order structural model. In the second-order model, a latent construct of second-order, "Agri-fresh Food Supply Chain Quality (AFSCQ)" was formed through a thoughtful construct model. The initial prerequisite for this type of modeling is that totally first-order latent constructs should have a considerable correlation. The correlations among AFSCQ Practices (first-order latent constructs) are shown in Table 6, which shows that correlations are considerable at the level of 0.01, correspondingly. Consequently, the analysis recommends the continuation of a second-order latent construct.

Afterward proposing the second-order latent construct (AFSCQ), the model-fit indices for the second-order structural model were chi square ($\chi 2$) = 390.798, Degree of Freedom (DF) = 165, ($\chi 2$)/df = 2.368, GFI = 0.900, AGFI = 0.873, RMR = 0.031, NFI = 0.860, CFI = 0.913 and RMSEA = 0.061. All model fit indices are in the acceptable range. It shows that AFSCQ takes into consideration a second-order construct with five sub-dimensions. The constructs of OS measures as ECS, SOS and ENS were also exposed to CFA and were also attained to be acceptable. The finalized multi factor structural model of AFSCQ practices and OS was built as exposed in Fig. 3. The measures of quality for the multi factor structural model are depicted in Table 7 All measures of statistical quality for the model were in acceptable limit. The model-fit indices for the finalized multi factor structural model were chi square ($\chi 2$) = 966.506, Degree of Freedom (DF) = 485, ($\chi 2$)/df = 1.993, GFI = 0.850, AGFI = 0.826, RMR = 0.039, NFI = 0.794, CFI = 0.884 and RMSEA = 0.052, which are acceptable in terms of model fit. Moreover, the loadings for distinctive relationships in the model are presented in Fig. 3.

4.3 Discussion of various hypotheses

The results show in what manner AFSCQ practices associate with AFSCQ and how AFSCQ associate with economic, social and environmental sustainability of an organization in Indian context. Table 8 displays the standardized estimates (β) as well as consequence of hypotheses.

$^{***}P < 0.001$; $^{*}P < 0.5$

4.4 Formation of AFSCQ as a result of AFSCQ practices (H1; H2; H3; H4; H5)

Table 8 shows hypothesis results of the structural model. It indicates a significant relationship between AFSCQ and

Table 4 Testing of the first-order structural model

Construct	Items	Estimate (Unstandardized)	Estimate (Standardized)	Standard Error (SE)	Critical Ration (C.R.)	P	Squared multiple correlations (R^2)	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's alpha (α)	Communality (CO)		Construct loading	P
TMLC_ AFSCQ	TMLC_ AFSCQ1	0.758	0.662	0.080	9.515	***	0.450	0.47252	0.781116	0.758	0.619	0.557	0.766	***
	TMLC_ AFSCQ2	0.991	0.675	0.103	9.620	***	0.436				0.583			
	TMLC_ AFSCQ3	0.865	0.660	0.091	9.500	***	0.456				0.585			
	TMLC_ AFSCQ4	1.000	0.671	——	——		0.438				0.614			
CF	CF1	0.540	0.706	0.049	10.997	***	0.471	0.496412	0.795936	0.775	0.741	0.615	0.807	***
	CF2	0.683	0.715	0.062	11.085	***	0.501				0.600			
	CF3	1.000	0.708	——-	——-		0.511				0.627			
	CF4	0.728	0.686	0.067	10.791	***	0.498				0.581			
SM	SM1	0.686	0.748	0.049	14.073	***	0.772	0.581318	0.847351	0.809	0.655	0.350	0.556	***
	SM2	0.590	0.637	0.049	12.033	***	0.391				0.632			
	SM3	0.726	0.626	0.061	11.806	***	0.405				0.593			
	SM4	1.000	0.878	——-	——-		0.560				0.785			
SCIMIT	SCIMIT1	0.700	0.667	0.080	8.769	***	0.374	0.468886	0.775116	0.729	0.625	0.525	0.726	***
	SCIMIT2	0.807	0.655	0.093	8.699	***	0.446				0.570			
	SCIMIT3	0.749	0.668	0.085	8.774	***	0.430				0.710			
	SCIMIT4	1.000	0.611	——-	——-		0.445				0.571			
IM	IM1	0.890	0.724	0.081	10.956	***	0.434	0.49464	0.795597	0.775	0.630	0.618	0.825	***
	IM2	1.000	0.736	——-	——-		0.363				0.668			
	IM3	0.730	0.602	0.076	9.666	***	0.542				0.539			
	IM4	0.849	0.659	0.082	10.374	***	0.524				0.557			

Table 5 CR, AVE, MSV, ASV and correlations between constructs

Constructs	Composite Reliability (CR)	Average Variance Extracted (AVE)	Maximum Shared Variance (MSV)	Average Shared Variance (ASV)	SCIMIT	TMLC_ AFSCQ	IM	CF	SM
SCIMIT	0.775116	0.468886	0.4109	0.2798	*0.6847*				
TMLC_ AFSCQ	0.781116	0.47252	0.3956	0.3184	0.524	*0.6874*			
IM	0.795597	0.49464	0.4369	0.3449	0.641	0.629	*0.7033*		
CF	0.795936	0.496412	0.4369	0.3375	0.586	0.612	0.661	*0.7046*	
SM	0.847351	0.581318	0.2421	0.1892	0.365	0.492	0.418	0.465	*0.7624*

Diagonal in italics shows square root of Average Variance Extracted (AVE); off-diagonal denotes correlations between constructs.

TMLC_AFSCQ ($\beta = 0.757$; $p < 0.001$), AFSCQ and CF ($\beta = 0.797$; $p < 0.001$), AFSCQ and SM ($\beta = 0.574$; $p < 0.001$), AFSCQ and SCIMIT ($\beta = 0.738$; $p < 0.001$), AFSCQ and IM ($\beta = 0.822$; $p < 0.001$). This proves the hypotheses H1, H2, H3, H4, and H5.

4.5 Relationship of AFSCQ with ECS, SOS and ENS (H6a; H6b; H6c)

AFSCQ positively influenced ECS of an organization in Indian context and validated the hypothesis H6a ($\beta = 0.337$; $p < 0.001$). AFSCQ positively influenced SOS and validated the hypothesis H6b ($\beta = 0.241$; $p < 0.001$). The hypothesis testing results relating to H6c ($\beta = 0.055$; $P < 0.5$) do not support the relationship concerning AFSCQ to ENS of an organization in Indian context. This indicates that Indian firms do not give priority to ENS, thereby supporting the idea of sustainability through AFSCQ. Although Indian industry, which relates to agri-fresh food, have started implementation of AFSCQ practices, i.e., TMLC_AFSCQ, CF, SM, SCIMIT and IM; these AFSCQ practices need to be interpreted further in terms of better economic, social and environmental sustainability from the Indian perspective.

Table 6 Pearson correlations among first-order construct (AFSCQ practices)

Correlations					
	TMLC_ AFSCQ	CF	SM	SCIMIT	IM
TMLC_ AFSCQ	1				
CF	0.479**	1			
SM	0.333**	0.368**	1		
SCIMIT	0.399**	0.450**	0.281**	1	
IM	0.485**	0.515**	0.311**	0.495**	1

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

5 Discussion

The research cultivates a theoretic base for AFSCQ from the perception of learning and proposes a theoretical and structural model that includes the impact of AFSCQ practices on OS. Siddh et al. (2015) proposed a similar kind of conceptual or theoretical model in lieu of the Perishable Food Supply Chain Quality (PFSCQ) then recommended numerous PFSCQ practices.

Khan and Qianli (2017) investigated the impact of five determinants of the green supply chain practices on organizational performance. Routroy and Behera (2017) addressed various important areas and the operational issues of the agriculture supply chain in detail. Post-harvest loss, food safety and quality, and perishability are found to be the major issues for ASC whereas traceability, logistics, and information technology are found to be the main areas of agriculture supply chain. AFSCQ comprises of internal practices, which are contained inside an organization and outside practices, which integrate an organization to its suppliers and customers (Ulwick 2005; Janvier-James 2012). Thus, the effective execution of AFSCQ practices offers opportunities to advance sustainability along the supply chain.

Primarily, various AFSCQ practices, in addition to measures of OS were identified from extensive literature review. AFSCQ practices are documented and categorized as SM, IM or PM and LM, CF and supportive practices like TMLC_ AFSCQ, SCIMIT etc. Shukla and Jharkharia (2013) also studied the literature on key operational issues in agri-fresh produce supply chain management intended for post-harvest waste. Generally, financial measures were assessed in terms of OS. Kaplan and Norton (1992) reported numerous perceptions of performance measurements, such as financial customer satisfaction, invention, internal processes, etc. Siddh et al. (2017) reviewed extensive literature on AFSCQ and stated that OS completely accomplished these by economic sustainability in addition to social and environmental sustainability.

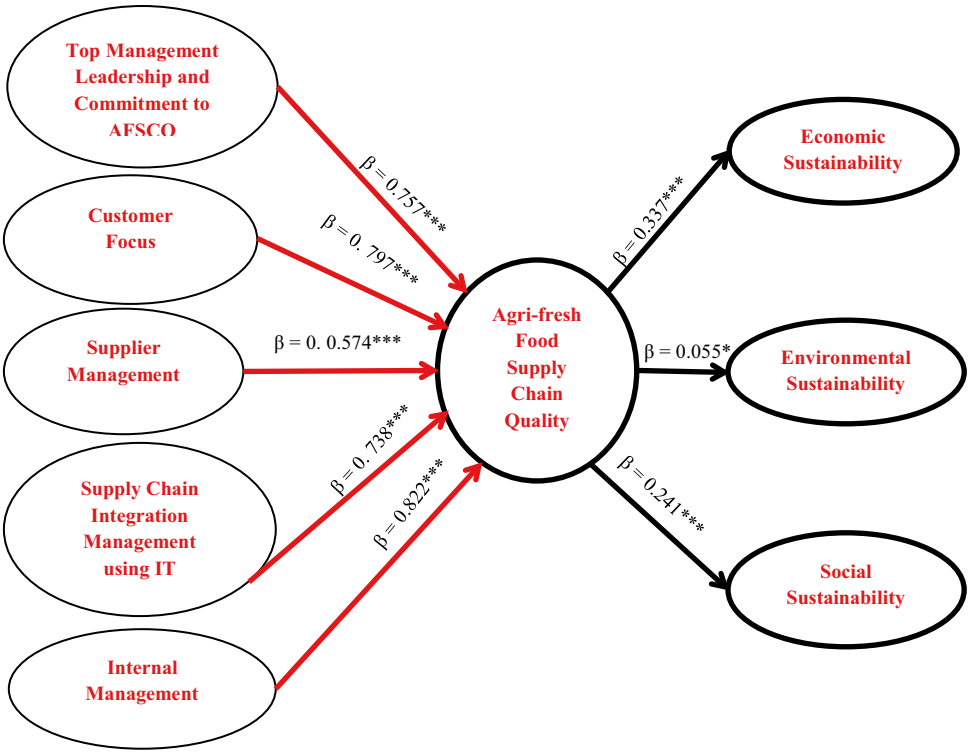

Fig. 3 Loadings for distinctive relationships in the structural model

To test the theoretical framework of AFSCQ practices and OS, the empirical research methodology is used and survey research design is important part of this approach (Soni and Kodali 2012; Shan and Zhu 2013). In India, the major Agri-fresh food supply chains are: Manufactured (processed) food supply chain, Conserved (frozen) food supply chain, and Local (short) food supply chain (Cagliano et al. 2016). Henceforth, these three sectors are counted in the survey of supply chains involved in agri-fresh food in the Indian food industry. The manufactured food comprises processed food, often through developed or industrialized processes, utilizing a collection of ingredients derived from numerous resources, often spread out across the world and pre-processed. Supply networks are generally multifaceted and dynamic; often corresponding with those of challengers or competitors. They commonly function on a large-scale and include big organizations. The conserved (frozen) food includes a collection of conservation practices or techniques (canning, pasteurization, freezing, chilling, controlled atmosphere, etc.); food can be saved or stored for longer periods and transported or moved over long distances. Nowadays, fresh fruit and vegetables and dairy produce can be traded as conserved food. Local (short) food supply chain includes short-distance, small-scale supply chains, usually involving medium/small companies and traditional products. They are mainly appropriate for fresh or extremely perishable food products that need very little time from the farm to the table.

Table 7 Examining the quality of the multi-factor structural model

Constructs	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's alpha (α)	Communality (CO)
TMLC_AFSCQ	0.47252	0.781116	0.758	0.586
CF	0.496412	0.795936	0.775	0.652
SM	0.581318	0.847351	0.809	0.444
SCIMIT	0.468886	0.775116	0.729	0.539
IM	0.49464	0.795597	0.775	0.611
AFSCQ	0.515443	0.760407	0.776	0.998
ECS	0.588935	0.850794	0.773	0.858
SOS	0.588004	0.822161	0.830	0.524
ENS	0.498469	0.799008	0.674	0.652

Table 8 Results of the structural model

Hypothesis	Estimates (Standardized) (β)	Standard Error (S.E.)	Critical Ratio (C.R.)	P-value	Results
H1:AFSCQ –→TMLC_AFSCQ	0.757	0.087	8.476	***	Supported
H2: AFSCQ –→CF	0.797	——	——	***	Supported
H3: AFSCQ –→SM	0.574	0.086	8.068	***	Supported
H4: AFSCQ –→SCIMIT	0.738	0.093	8.129	***	Supported
H5: AFSCQ –→IM	0.822	0.079	8.747	***	Supported
H6a: AFSCQ –→ECS	0.337	0.050	4.513	***	Supported
H6b: AFSCQ –→SOS	0.241	0.061	3.627	***	Supported
H6c: AFSCQ –→ENS	0.055	0.054	0.779	0.436 (*)	Not supported

The data collected for this study sustain the main necessity as a sample size of 369. Hutcheson and Sofroniou (1999) suggested a minimum of 150–300 responses, though, Comrey and Lee (1992) considered a sample size of 200 to be acceptable for factor analysis. To check the elementary characteristics of data, descriptive statistics are utilized. Soni and Kodali (2012) stated that descriptive statistics attains the dominant status in techniques of quantitative data analysis. Devalkar et al. (2018) discussed applications of data science in Indian agriculture. Internal consistency analysis was utilized to assess reliability of each construct (Nunnally et al. 1967). The estimate Cronbach 's alpha is a measure of internal consistency. The final Cronbach 's alpha scores for constructs varied from 0.674 to 0.830, which is a satisfactory indicator of reliability of the scale. The value of Cronbach 's alpha higher than 0.6 is preferred to reveal internal consistency. According to Flynn et al. (1990) the greatly favored value of Cronbach 's alpha is 0.7. To examine one-dimensionality the value of R-squared is calculated by means of CFA. The value of R-squared is varying from 0.236 to 0.772. Falk and Miller (1992) suggested that R-squared values should be equal to or greater than 0.10 for the variance explained of a distinct endogenous construct to be deemed acceptable. The value of CFI is varying from 0.980 to 0.996 for entirety constructs. Gotschol et al. (2014) suggested the acceptable limit for CFI is 0.88 to 1.00. The value of GFI is differing from 0.990 to 0.996 for entirety constructs. Gotschol et al. (2014) also recommended the tolerable limit for GFI as 0.75 to 0.99. The value of NFI is differing from 0.971 to 0.994 that supports convergent validity. The tolerable limit for NFI is 0.72—0.99 (Gotschol et al. 2014).

To examine these constructs, the first order and second order measurement model are utilized. In the first order measurement model TMLC_AFSCQ, CF, SM, SCIMIT, and IM are linked respectively as per measurement dimensions designed for AFSCQ. The second order measurement model is utilized to evaluate involvement level of all AFSCQ practice with AFSCQ. The model fit-indices for first order structural model are in acceptable range. It shows absolute depiction of construct of AFSCQ.

Afterward, AFSCQ is conceptualized as a second-order construct with five sub-dimensions: TMLC_AFSCQ, CF, SM, SCIMIT, and IM. A second-order structural model of AFSCQ is established by the utilization of AMOS by means of ML estimation method. The values of various model fit indices for second-order structural model are as follows; chi square ($\chi 2$) = 390.798, Degree of Freedom (DF) = 165, ($\chi 2$)/df = 2.368, GFI = 0.900, AGFI = 0.873, RMR = 0.031, NFI = 0.860, CFI = 0.913 and RMSEA = 0.061. All model fit indices are in acceptable range. It shows that AFSCQ takes into consideration a second-order construct with five sub-dimensions.

To examine the relationship among AFSCQ (TMLC_AFSCQ, CF, SM, SCIMIT, and IM), ECS, SOS and ENS, a multi-factor congeneric measurement model has been established by a number of statistical processes. Also, a multifactor congeneric structural model has been established to assess the relationship between AFSCQ and practices of AFSCQ (H1, H2, H3, H4, and H5), AFSCQ and ECS (H6a), AFSCQ and SOS (H6b), AFSCQ and ENS (H6c). The overall fit statistics for the hypothesized model are χ 2 = 966.506, df = 485, χ 2/df = 1.993, GFI = 0.850 AGFI = 0.826, RMR = 0.039, NFI = 0.794, CFI = 0.884 RMSEA = 0.052, which are acceptable in terms of model fit.

The result of hypothesis indicates a significant relationship between AFSCQ and TMLC_AFSCQ (β = 0.757; $p < 0.001$), AFSCQ and CF (β = 0.797; $p < 0.001$), AFSCQ and SM (β = 0.574; $p < 0.001$), AFSCQ and SCIMIT (β = 0.738; $p < 0.001$), AFSCQ and IM (β = 0.822; $p < 0.001$). This proves the hypotheses H1, H2, H3, H4, and H5. AFSCQ positively influenced ECS of an organization in Indian context and validated the hypothesis H6a (β = 0.337; $p < 0.001$). AFSCQ positively influenced SOS and validated the hypothesis H6b (β = 0.241; $p < 0.001$). Hypothesis testing results relating to H6c (β = 0.055; $P < 0.5$) do not support the relationship concerning AFSCQ to ENS of an organization in Indian context. This indicates that Indian firms do not give priority to ENS, thereby supporting the idea of sustainability through AFSCQ.

5.1 Managerial implications

The findings of the study contribute toward several suggestions for managers and practitioners. In this study, it is revealed how probable practices of AFSCQ can be utilized to assess OS. The common barrier in implementing AFSCQ practices is overcoming customary practices. As the Indian economy is in the developing stage, India still needs to carry out the finest practices from around the world. Old organizations regarding organizational sustainability offer adequate conflict in employing innovative practices. Consequently, Indian managers should be trained to instruct and campaign revolution in organizations subsequently to realize tangible advantages of AFSCQ practices. AFSCQ practices should be communicated to upstream side and downstream side members of supply chain, so that supply chain partners can put efforts into synchronization.

In India, majority of companies are new to AFSCQ initiatives. Consequently, this study contributes to an understanding of the practices of AFSCQ and what constitutes these practices of AFSCQ. Indian managers can utilize these AFSCQ practices in a framework to attain organizational sustainability. The benefit of the concerned research study is that AFSCQ practices and dimensions of OS are empirically developed from Indian agri-fresh food industry. This study also gives directives for attaining organizational sustainability through AFSCQ initiatives. Moreover, it helps a manager comprehend cause and effect and link them among numerous important constructs in supply chain. Such types of links can be utilized in the identification of any kind of failing in agri-fresh food supply chain. Finally, if a manager of agri-fresh food supply chain envisages organizational sustainability, AFSCQ practices and their constructs can be counted as main factors which can advance the supply chain partners to the OS.

6 Research Implications

Researchers should focus on verifying already existing theories in AFSCQ as a enough volume of literature on theory building is collected and must be verified in different conditions. It is also observed that literature on AFSCQ necessitates standardized constructs. Generally, AFSCQ is affected by material, logistics, supplier, distribution, demand, purchasing, marketing, and information management. Consequently, it relies on various issues, among them are certain issues regularly studied by researchers, while other issues are specifically focused, such as supply chain efficiency, risk management, industrial supply chain quality, supply chain security, supply chain quality, relationship quality, strategic alignment, visibility, end deliverable quality, etc. This may necessitate additional attention by researchers towards carrying out empirical research in the AFSCQ area.

In the future, empirical research necessities need to be directed at intra-functional and intra-firm levels. If possible, such empirical studies can focus on an entire supply chain network as well. However, they should at least concentrate on the dyad level, where interaction of small firms with distributors is investigated. AFSCQ has a main influence on sustainable performance of an organization as AFSCQ practices sum up along the complete length of the supply chain. Sustainable performance comprises economic, social and environmental sustainability. Distinct from traditional performance measures, such as sales, return on investment, and market share, etc., sustainable performance consists of economic, environment and social sustainability.

Most research papers pertaining to the field of AFSCQ are from developed countries, but there is not as much awareness of AFSCQ in developing countries. Numerous researchers have emphasized that there is a gap between theoretical and practical aspects in AFSCQ research. To fill this gap, panel studies as well as focus group research designs which involve AFSCQ practitioners can significantly improve feasibility of studies in AFSCQ. Another concern is that there is a scarcity of utilization of longitudinal data in AFSCQ research. While, longitudinal studies span an extensive phase of research, they can deliver effective depiction of the system or organization and its active or dynamic character contrasted to cross sectional research. Descriptive statistics are imperative however, to set up hypothesis; while inferential statistics are indispensable. Therefore, it is essential to implement advanced forms of data analysis techniques accompanied by descriptive statistics. Though multi-variate data analysis techniques, such as SEM are being utilized in AFSCQ, researchers still should use them even more frequently to get deeper insights into the relevant area. The suggested conceptual framework for AFSCQ and OS assuages aspiring researchers to examine reliability and validity in other settings in order to set up an advanced and comprehensible set of AFSCQ practices and dimensions of OS so as to remove the discrepancies in theory of AFSCQ, if any.

7 Conclusion

The objective of the paper was to measure the degree of Agri-fresh Food Supply Chain Quality (AFSCQ) practices adoption in Indian agri-fresh food industry and to test its impact on Organizational Sustainability (OS) in terms of Economic Sustainability (ECS), Social Sustainability (SOS) and Environmental Sustainability (ENS). The Indian agri-fresh food industries have been found to primarily use five practices, namely, Top Management Leadership and Commitment to AFSCQ (TMLC_AFSCQ), Customer Focus (CF), Supplier

Management (SM), Supply Chain Integration Management using IT (SCIMIT) and Internal Management (IM) resulting in a positive impact on the organizational sustainability. Consequently, we may conclude that the implementation of AFSCQ practices in Indian agri-fresh food industry is likely to make a significant contribution to organizational sustainability. The outcomes of this study are consistent with the findings of Govindan (2018) and Mani et al. (2020). The work fills the gap in the literature concerning the impact of AFSCQ practices on the organizational sustainability. The methodologies implemented in this study are completely justified in the literature, and the outcomes are harmonious with existing research. This research will advance both practitioners and policymakers comprehension of the roles of AFSCQ practices in enriching organizational sustainability for a promising future.

8 Limitations and future research directions

The proposed study focuses on various practices associated with AFSCQ and dimensions of OS. The empirical investigation of AFSCQ and OS is restricted to Indian agri-fresh food industry. This type of study could be launched in other countries utilizing related methodology. Various assumptions were made in this study. These included: sample size should be enough; observed variables (items) scale should be continuous; hypothesized model should be authentic; observed variable (items) distribution should be multivariate normal. Additionally, we have used a sample size of 369 which can be increased for an even better approach. This work has been performed on a select Indian industry, but other industries from all over the world can be included in the study and also to carry out comparative analysis.

Primarily, post-harvest agri-food supply chain was taken into consideration throughout our research. Highly perishable products, like dairy products, were excluded from the scope of our research. Agri-fresh food supply chain is one of the most complex supply chain networks. Therefore, future research lies in integrating different members or stages of the supply chain which generally lacks in the current Agri-fresh food supply chain in general and developing countries like India in specific.

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