A systematic analysis of quality management in agri-food supply chains: a hierarchy of capabilities perspective

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Abstract

Purpose – This paper aims to systematically review the literature on quality management in agri-food supply chains (SCs) and propose an integrated conceptual framework.

Design/methodology/approach – A systematic literature review that analyses 93 papers in peer-reviewed academic journals published from 1996 to November 2021 is conducted. A conceptual model is advanced.

Findings – Based on a hierarchy of capabilities perspective, the authors develop an integrated conceptual framework in which SC quality (SCQ) management practices promote three levels of SC dynamic capabilities, which in turn lead to agri-food SCQ performance.

Originality/value – The authors propose a hierarchy of capabilities perspective of quality management in agri-food SCs and develop a conceptual framework. Furthermore, a number of propositions based on dynamic capabilities and the review findings are provided. Four future research directions are presented.

Keywords Quality management, Agri-food supply chain, Literature review, Dynamic capabilities, Quality performance

Paper type Literature review

1. Introduction

The supply chain (SC) quality management (SCQM) is "the formal coordination and integration of business processes involving all partner organizations in the supply chain to measure, analyze, and continually improve products, services, and processes in order to create value and achieve satisfaction of intermediate and final customers in the marketplace" (Robinson and Malhotra, 2005, p. 319). Over the years, various agri-food-related scandals have occurred, causing serious impacts on companies and the society. For example, the horsemeat scandal in 2013 infiltrated numerous SCs and led to millions of products being recalled. The scandal of Lactalis infant milk contaminated with Salmonella in 2017 because of contamination of one drying tower resulted in product recalls. Indeed, agricultural product quality management is a complex system engineering issue covering multiple links such as planting, production and processing. Integrating quality management with SC management may be an important way to solve the quality problems of agricultural products and improve firm performance (Yu and Huo, 2018).

SCQM can minimize agri-food product defects and reduce quality variation in agri-food SCs (Yang and Wei, 2013; Ben-Daya *et al.*, 2021). Academia and industry have paid much attention to quality management in SCs to ensure food quality and safety by focusing on the development of quality traceability systems, quality risk analysis, quality coordination mechanisms, quality standards (QSs) and quality optimization, among others (Groot-Kormelinck *et al.*, 2021; Aung and Chang, 2014; Hammoudi *et al.*, 2009).

However, there is a lack of systematic review of agri-food SCQM research, leading to a underdeveloped conceptualisation. For example, Siddh *et al.* (2015) conducted a review on the quality of the perishable food SC and presented a structured literature review of existing literature on agri-fresh food SC quality (SCQ) (Siddh *et al.*, 2017). Ben-Daya *et al.* (2021) focused on role of internet of things and other enabling technologies such as blockchain on food SCQM. However, these

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reviews touch on a few elements of SCQM, for example, technology.

There are intrinsic challenges involved in agri-food SCs. Because of the seasonality and difficulty in standardization of agricultural products, as well as long SCs involving multiple tiers, the negative impact of the instability of the external environment is exacerbated (Siddh *et al.*, 2017). Scholars have pointed out that agri-food companies urgently need to improve their dynamic capabilities to deal with the dynamic market environment (Yu *et al.*, 2018). Dynamic capabilities are the company's ability "to sense and then seize new opportunities, and to reconfigure and protect knowledge assets, competencies, and complementary assets with the aim of achieving a sustained competitive advantage" (Augier and Teece, 2009, p. 412). They enable companies to respond to or even pre-empt environmental changes through the transformation of business processes, resource allocations and reallocations (Teece, 2007) and knowledge creation and dissemination and continuous modification of organizational processes in response to environmental changes (Easterby-Smith *et al.*, 2009). The application of the dynamic capabilities view to strategic decisions in SC management is becoming increasingly common (Defee and Fugate, 2010).

SC dynamic capabilities allow the agri-food companies along the SC to form a complex adaptive system, which is conductive to sense changes in the marketplace, seize new quality creation opportunities to satisfy customer demand (Whitten *et al.*, 2012). The key issue of SCQM is the dynamic interconnection of quality management activities throughout the SC. Through the SC dynamic capabilities, the SCQM practices run more smoothly between departments and node enterprises, realize the quality cooperation and control throughout SC members, which not only reduce the negative impact of information asymmetry but also reduce the risk of opportunistic behaviour, and promote quality performance (Groot-Kormelinck *et al.*, 2021). In spite of these laudable efforts, the role of SC dynamic capabilities has been largely ignored in SCQM. Given this, we focus on the quality management in agri-food SC and explore the role of SC dynamic capabilities in the relation between agri-food SCQM practices and SCQ performance. Based on above discussion, we develop the following research questions:

RQ1. What are the research themes in SCQM in agri-food SCs?

RQ2. What role does SC dynamic capability play in the relation between SCQM practice and agri-food SCQ performance?

To answer the questions, 93 papers were identified for the literature review in the overlapping fields of quality management and agri-food SCs in the Scopus and Web of Science databases from 1996 to December 2021. Based on the thematic findings, a conceptual framework was developed from a hierarchy of capabilities perspective, together with four propositions that explain the relationships among the key themes identified. Finally, we summarized the gaps in the existing research and recommended some actionable future research directions, in the fields of agri-food SCQM.

The remainder of this paper is organized as follows. Section 2 gives the basic terminological groundwork and the basic theory. Section 3 illustrates the methodology followed to conduct the review and perform descriptive analysis. In Section 4, we report the most relevant results from the analysis of the coded articles. In Section 5, conceptual development is further conducted to advance research propositions based on the integration of the literature review results and our discussion from a dynamic capability perspective. Section 6 describes possible future research directions; and finally, Section 7 concludes the study.

2. Theoretical background

2.1 Conceptualising agri-food supply chain quality management

Operations and SC management scholars have discussed the need to implement quality management across entire SCs (Robinson and Malhotra, 2005). Companies integrate both intra- and inter-organizational resources and capabilities to develop overall organizational capabilities because strategic resources are derived not only within but also across firm boundaries (Mathews, 2003). Agri-food SCQM emphasizes that through integration and collaboration (Ding *et al.*, 2014; Zhang *et al.*, 2019) and process control (i.e. QSs, quality certification, quality traceability, etc.) (Tenorio *et al.*, 2021), all members along agri-food SCs (i.e. cooperatives, farmers, customers, etc.) jointly measure, analyse and continually improve products, services and processes (Mowat and Collins, 2000; Tenorio *et al.*, 2021), to ensure agricultural product quality and SCQ reliability, which is defined as quality performance stability throughout the SC, that is, the degree to which an SC yields consistent quality performance in different nodes over time through various conditions (Macheka *et al.*, 2017).

A number of recent studies have provided a fertile area for elucidating SCQM practices. For example, Song *et al.* (2017) contended that through intra- and inter-SCQM, the agri-food companies can prevent quality crisis in its SC operations. Following the definition by Robinson and Malhotra (2005) and Song *et al.* (2017), SCQM can be classified by two dimensions: intra-organizational SCQM, which is related to traditional quality management practices within organization, and inter-organizational SCQM, including supplier quality management and customer quality management (Song *et al.*, 2017). Inter-organizational SCQM is a key practice to structure inter-organizational strategies, practices and procedures into collaborative and synchronised quality related processes to fulfil its customers' quality requirements. For the performance category, we have identified two constructs that emerged from the paper analysed, that is, agri-food quality and SC reliability (Tanik, 2010; Gunasekaran *et al.*, 2008; Zio, 2009). These categories are adopted to code the reviewed papers, which is depicted in Table 1.

2.2 Hierarchy of capabilities perspective

Dynamic capability is a firm's capability to coordinate and build internal and external resources to address rapidly changing environment (Teece *et al.*, 1997), for example, jointly responding to changes in QSs. Agri-food companies should integrate both intra- and inter-organizational resources and capabilities (i.e. QSs, quality optimization and quality traceability) to realize superior quality performance. The concept of dynamic capability is traditionally used at a firm level. But an increasing number of studies have acknowledged that it should be extended to an SC

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Table 1 Categories of SCQM practices and performance

Categories	Description
SCQM practices	
Intra-SCQM practices	Intra-SCQM practices is related to ensuring agri-food SCQ through entrepreneurial implementation of cross-functional management and coordinative control behaviour within the enterprises (Song *et al.*, 2017; Hong *et al.*, 2020; Siddh *et al.*, 2017; Robinson and Malhotra, 2005)
Inter-SCQM practices	Inter-SCQM practices refers to ensuring agri-food SCQ through process control and improvement, and coordination among external supply chain members (Song *et al.*, 2017; Hong *et al.*, 2020; Siddh *et al.*, 2017; Robinson and Malhotra, 2005)
SCQM performance	
Agri-food quality	Agri-food quality is measured as "up to standards" and "conforms to customers' requirement" (Juran, 1993)
Supply chain reliability	Reliability is a fundamental attribute for the safe operation of an agri-food supply chain (Tanik, 2010) because of variations in quality (i.e. some of the components not conforming to the quality standards) and link vulnerability (Tanik, 2010; Gunasekaran *et al.*, 2008; Zio, 2009)

context, which is embedded within the collaborative routines formed between multiple SC partners to adapt to the external dynamic environment and promote the effective implementation of all SC activities (Defee and Fugate, 2010).

In this study, we adopt the theory of hierarchy of capabilities (Hine *et al.*, 2014; Mishra *et al.*, 2013) because we found that there are different levels of capabilities required to achieve superior quality performance in the reviewed papers. According to the theory, there are three levels of capabilities ranging from basic ordinary capabilities to higher-order dynamic and metaphysical capabilities (Winter, 2003), that is, ordinary capabilities (i.e. SC coordination capabilities), dynamic functional capabilities (i.e. SC process control capabilities) and dynamic SC learning capabilities (Hine *et al.*, 2014), as shown in Table 2. Ordinary capabilities are non-change focused and maintain the status quo, thereby supporting competitiveness (Winter, 2003; Kleinschmidt *et al.*, 2007). Dynamic functional capabilities are change focused but are directly responsible for firm outputs and performance in dynamic environments. Dynamic learning capabilities focus on creating new capabilities and acting through existing capabilities to impact firm outputs and performance (Helfat and Eisenhardt, 2004; Winter, 2003). The first two are lower in the capability hierarchy than dynamic learning capabilities (Eisenhardt and Martin, 2000).

3. Research approach and descriptive analysis

3.1 Research approach

Conceptual theory building method is adopted in this paper, which is a "logical deduction" that helps bring about the conceptual framework's propositions (Carter and Rogers, 2008). The method includes two steps: firstly, evaluating a body of literature to summarize the common elements and contrast the differences, and secondly, integrating a selected theory (e.g. dynamic capability) to advance research propositions, and therefore, build the final conceptual framework (Meredith, 1993; Carter and Rogers, 2008).

A systematic literature review was first conducted to identify and critically evaluate peer-reviewed articles that focus on quality management in agri-food SC using the four-step methodology proposed by Rowley and Slack (2004).

Firstly, we searched all possible combinations among quality-related terminologies and agriculture- and SC-related keywords in the Scopus and Web of Science databases, the most comprehensive and commonly used databases in recent reviews (Ahi and Searcy, 2013; Jia *et al.*, 2017; Yang *et al.*, 2019). The keywords about quality management were chosen based on previous literature reviews on similar topics (Agrawal *et al.*, 2021;

Table 2 Supply chain dynamic capability hierarchy

Levels	Resource	Resource structure	Capability
Dynamic learning capability	Knowledge resources	Relationship between knowledge resources, for example, ICT-enable knowledge	SC quality learning capability
Dynamic functional capability	Process resources	Relationship between process resources	SC process control capability
Basic ordinary	Internal and external basic resources	Relationship between internal and external basic resources	SC quality coordination capability

Notes: SC = denotes supply chain; ICT = information and communication technology

Yoo and Cheong, 2018; Aramyan *et al.*, 2007). Furthermore, the keywords related to the agri-food SC were chosen based on Yang *et al.* (2019) and Luo *et al.* (2018). The "'*'" sign was used at the end of some keywords to expand the range of possible studies (Gimenez and Tachizawa, 2012). We then selected the most relevant subject areas.

We also searched only English-language articles in peer-reviewed journals using an open starting time to trace the literature back to its origin up to November 2021 when the last search was conducted. We then identified the most relevant subject areas and chose the document type of "article". As a result, 1880 relevant papers were found. Secondly, we evaluated the articles by scanning the titles and abstracts, applying the inclusion and exclusion criteria that were determined through exhaustive discussion within the research group. This process resulted in 274 potentially relevant papers for the third round of selection. Thirdly, by reading and analysing the full texts, we identified 91 relevant articles to include in this review.

Finally, we adopted a cross-referencing approach by checking references and further identified two more relevant articles. Lastly, we identified 93 papers for the final review. The overall review process is shown in Figure 1.

3.2 Descriptive analysis

3.2.1 Distribution of publications across the period

The time period of publications is from 1996 to 2021 (Figure 2). The year 1996 represents the beginning of the debate on quality control in fresh vegetable SCs in the literature (Grimsdell, 1996). The trend can be divided into two phases:

1 the initial growth phase between 1998 and 2008; and
2 the development phase between 2009 and 2021. In particular, in 2009 and 2016, there were 9 and 10 contributions, respectively.

Our final search, conducted in November 2021, found that seven papers had been published thus far in that year.

3.2.2 Distribution of publications across journals

The 93 articles selected were distributed in 37 journals, as shown in Table 3. We found that within the 37 journals, the top four contributing journals in our topic were *Food Control* (15 papers), *SCM: An International Journal* (11 papers), *British Food Journal* (10 papers) and *International Journal of Production Economics* (7 papers). It is worth noting that the list of journals accounts for approximately 46% of the reviewed publications and that the journals included play dominant roles in this research field.

The 37 journals reflect that the topic spans boundaries and encompasses several disciplines. For example, the operations and supply chain management discipline, including *Supply Chain Management: An International Journal*, *International Journal of Production Economics*, *Production Planning and Control*, *European Journal of Operational Research* and *International Journal of Operations and Production Management*; the food science discipline, including *Food Control*, *British Food Journal* and *Food Policy*; the industrial and manufacturing engineering discipline, including *Expert Systems with Applications*, *Industrial Management and Data Systems*, *Computers and Industrial Engineering* and *Journal of Manufacturing Technology Management*; the quality management discipline, including *TQM Journal*, *Benchmarking: An International*

Figure 1 Overall review process

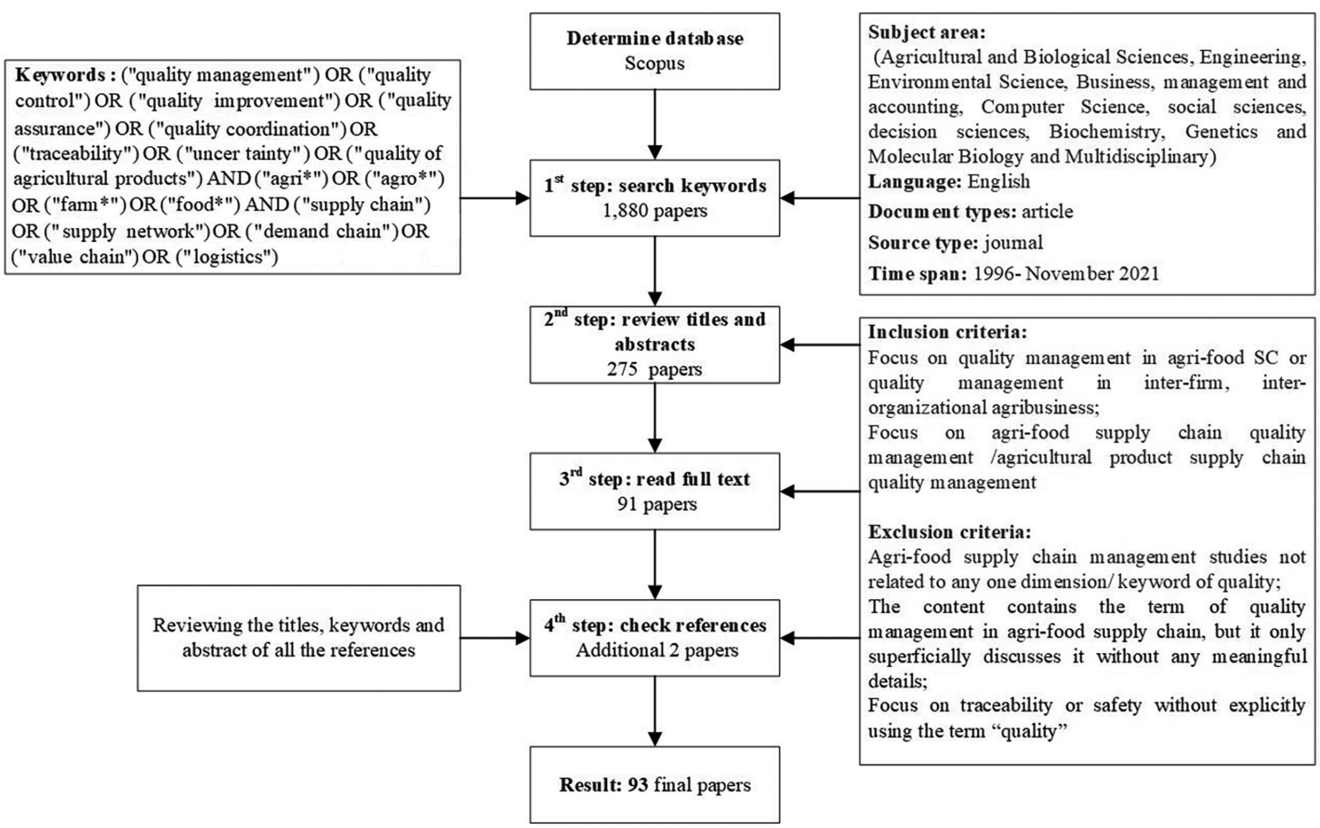
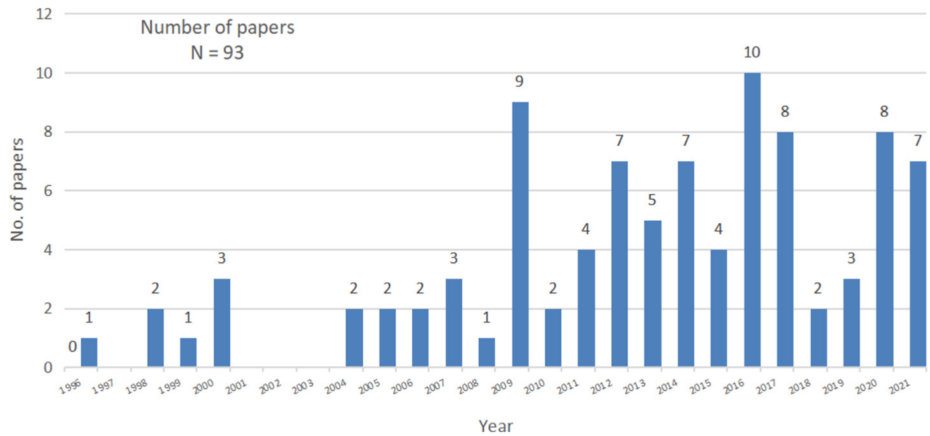


Figure 2 Distribution of publications per year across the period studied



Journal and *International Journal of Quality and Reliability Management*; the agricultural economics discipline, including *Journal of American Journal of Agricultural Economics* and *European Review of Agricultural Economics*; and the economics (general) discipline, including *Actual Problems of Economics* and Emerging Markets Finance and Trade. Further, the scope of the articles published in different disciplines is similar. They all contain SCQM practices, quality coordination, quality process control, quality traceability and quality optimization, however food science discipline and the industrial and manufacturing engineering discipline focus more on technical research, such as traceability technology and agri-food manufacturing technology.

3.2.3 Distribution of research methodologies and underlying theory
Among the 93 identified articles, regarding the research methodologies adopted, empirical research (including both case studies and surveys) was the most commonly used method, accounting for 72.04% of all papers. Using case studies, insights into complex and contemporary "real world" phenomena can be obtained (Yin, 2009). Using surveys, more accurate and credible knowledge can be obtained through validating multiple hypotheses.

The theoretical perspectives of the reviewed papers are shown in Table 4. It is important to note that most papers did not explicitly specify a theory underlying their research. This indicates that quality management in the agri-food SC is relatively young, and more theoretical development studies are still required.

4. Thematic analysis

4.1 Supply chain quality management practice

Among the existing studies of agri-food SCQM, articles largely adopt empirical analysis to investigate the impacts of SCQM practices on firm performance, including quality performance, sales performance (Hong *et al.*, 2020; Zhang *et al.*, 2019; Gaudenzi *et al.*, 2021), product recall capability (Zhang *et al.*, 2020, 2019) and domestic and export performance (Song *et al.*, 2017). For example, Song *et al.* (2017) found that intra- and inter-SCQM enhance a food company's export performance and that the effects are mediated by food certification. Hong *et al.* (2020) showed that supplier quality management, customer quality management and internal quality management have significant positive effects on an enterprise's quality safety performance and sales performance. Zhang *et al.* (2020) revealed that a food manufacturer can develop product recall capabilities by adopting SCQM practices, that is, applying a quality management teamwork, supplier qualifications and supplier involvement.

The implementation of SCQM is affected by a number of factors (Aung and Chang, 2014), such as a firm's quality leadership (Soares *et al.*, 2017), relationship management (Zsidisin *et al.*, 2016; Shankar *et al.*, 2018) and customer orientation (Wang and Dong, 2012; Wang *et al.*, 2017). In addition, the quality and safety management of agri-food is inseparable from the roles of the government (Chen *et al.*, 2022). Chen *et al.* (2014) exposed key issues in food SCQM and extracted useful managerial and policy insights using examples of the 2008 adulterated milk incident. Both self-regulation within the SC and collaborative regulation beyond the SC require all members along the SC to integrate resources, which is not only a sufficient condition for the efficient operation of integrated quality management and SC management but also a pre-requisite for the efficient operation of SCQM.

4.2 Quality coordination in agri-food supply chains

An effective quality coordination system is not only a sufficient condition for the efficient operation of integrated quality management and SC management but also a pre-requisite for the efficient SCQM (Zhang *et al.*, 2011a, 2011b; Kher *et al.*, 2010). Yan *et al.* (2017) indicated that when the enterprise funds are sufficient, collaboration and quality test ability have a positive influence on quality assurance level. Zhao *et al.* (2021) revealed that internal integration and supplier integration are the critical factors to improve product quality within the context of agri-food SC. SCQ coordination (SCQC) can ensure that QSs facilitate the quality process to fulfil customers' requirements, often through cross-functional quality management along with quality teamwork supported by quality activities and problem solving (Fernandes *et al.*, 2017).

Simatupang and Sridharan (2005) proposed an instrument to measure the extent of collaboration in an SC, including information sharing, incentive alignment and collaborative decision-making. Then, Borrás and Toledo (2007) extended it to a quality coordination framework in the food SC. The actual implementation of quality coordination system depends on the ability to collect specific information related to product quality

Table 3 Journals/articles distribution

Area/journal	No. of papers
Operations and supply chain management	
Supply Chain Management: An International Journal	11
International Journal of Production Economics	7
Production Planning and Control	4
European Journal of Operational Research	2
International Journal of Production Research	2
International Journal of Logistics Management	2
Production and Operations Management	1
Omega	1
Journal of Supply Chain Management	1
Journal of the Operational Research Society	1
Journal of Business Logistics	1
Annals of Operations Research	1
International Journal of Services Operations and Informatics	1
International Journal of Operations and Production Management	1
Food science	
Food Control	15
British Food Journal	10
Journal of Food service Business Research	1
Food Policy	1
Industrial and manufacturing engineering	
Expert Systems with Applications	4
Industrial Management and Data Systems	3
Computers and Industrial Engineering	2
Transportation Research Part E: Logistics and Transportation Review	2
Journal of Manufacturing Technology Management	2
Journal of Cleaner Production	2
International Journal of Computer Integrated Manufacturing	1
International Journal of Industrial Engineering and Management	1
Quality management	
TQM Journal	3
International Small Business Journal	1
Benchmarking: An International Journal	1
International Journal of Quality and Reliability Management	1
Agricultural economics	
American Journal of Agricultural Economics	1
European Review of Agricultural Economics	1
Economics (general)	
Actual Problems of Economics	1
Emerging Markets Finance and Trade	1
Economic Geography	1
Natural Resources Journal	1
Applied Economics	1
Total	93

Note: TCE = transaction cost economics

(Aiello *et al.*, 2015), collect real-time data (Ringsberg and Mirzabeiki, 2014; Zhu *et al.*, 2022), conduct effective data management (Wang *et al.*, 2009a, 2009b; Skilton and Robinson, 2010) and implement effective and efficient information sharing (Faisal and Talib, 2016). It is also inseparable from incentive alignment (Wever *et al.*, 2010) and joint decisions for agri-food SC members under supply uncertainty (Rijpkema *et al.*, 2016), tactical decisions about coordination of quality and safety requirements between agri-food SC members (Kirezieva *et al.*, 2016; Fu *et al.*, 2020).

4.3 Process control method in agri-food supply chains

Among the 93 identified articles, there were three main process control methods towards superior quality performance in agri-

Table 4 Distribution of underlying theories

Theory	Papers
Not specified	77
Specified	16
Resource-based view theory	2
Transaction cost theory	2
Actor-network theory	1
Auditing theory	1
Complexity theory	1
Configuration theory	1
Consumer theory	1
Contingency theory	1
Conventions theory	1
Critical success factors theory	1
Demand theory	1
Fuzzy control theory	1
Logarithmic series distribution theory	1
Mid-range theory	1
Normal accident theory	1
Organizational theory	1
Power-relationship commitment theory	1
Principal-agent theory	1
Property rights theory (PRT)	1
Reliability engineering theory	1
Signaling theory	1
sustainability theory	1
Stakeholder theory	1
Systems theory	1
TCE	1
Theory of repeated games	1

food SC: quality management system, quality optimization and quality traceability. We present them in detail in the following sub-sections.

4.3.1 Quality management system

Quality management system refers to organized and planned activities to achieve quality objectives including QSs, quality certification, quality assurance and the application of quality tools (Barendsz, 1998).

4.3.1.1 Quality standards. Generally, agri-food planting, production and management standards corresponding to quality management systems mainly include QSs, good agricultural practices (GAPs) and the international organization for standardization, which can guide companies to implement better standards (Chelsea and Cheong, 2012) and total quality management (Luai and Ihab, 2013). QSs can be used at every stage of the SC (Kuo and Hsiao, 2021) to improve food safety and increase customers' trust in food quality. However, most QSs require pre-requisite procedures (Sperber, 2005). For example, the lack of measures to eliminate or control identified hazards hinders the effective use of hazard analysis of critical control points (HACCP) in all stages of the SC. Therefore, to ensure the application of effective food QSs along an SC, SC members must communicate "farm to table food safety" rather than "farm to table HACCP" (Sperber, 2005) and communicate QSs and quality requirements to provide effective formal and informal quality monitoring mechanisms (Groot-Kormelinck *et al.*, 2021).

4.3.1.2 Quality tools. Some quality tools are increasingly introduced into agri-food quality and safety supervision for HACCP determination (Bertolini, 2006). For example, Tanik (2010) underlined the advantages of quality improvement tools such as quality functional development (QFD) and false mode and effects analysis in each link of a food SC to further ensure the effectiveness of all inter-related processes in the SC. Through QFD, consumers' cognition of agri-food process quality is regarded as consumers' demand, which guides and standardizes the production behaviour of farmers and processors (Haq and Boddu, 2014, 2015). Morgan and Dewhurst (2008) used a control chart to monitor the binary relationship in the supply network interface between multiple retailers and their suppliers to ensure the final delivery quality of food. Macheka *et al.* (2017) developed a diagnostic tool to assess the implementation level of core logistics and quality control activities and the vulnerability of the system because of its operating environment.

4.3.1.3 Quality assurance. Quality assurance is considered to be a mature mechanism for delivering agri-food quality (Manning *et al.*, 2006). Simpson *et al.* (1998) outlined the quality assurance methods for beef and mutton. Manning *et al.* (2006) analysed the implementation effect of quality assurance in an integrated food SC. Then, the benefits of implementing quality assurance in poultry SCs were discussed (Manning *et al.*, 2007). With technical support, Lao *et al.* (2011) studied quality assurance in the inventory receiving process. Aung and Chang (2014) proposed a quality assurance method based on the Euclidean distance costs of product metabolism changes and temperature variations for product quality management in a cold chain.

However, existing quality assurance systems differ greatly in terms of the stringency (and related costs) of the systems used. Miguel and Bruce (2007) developed a repeat purchase model to explore the basic economic factors behind enterprises' choice of different quality assurances and related stringencies. Moreover, the implementation of quality assurance is affected by vertical coordination partnerships (Ziggers and Trienekens, 1999). The implementation of quality assurance should cover the entire agri-food SC and have crossover (Manning *et al.*, 2007). Therefore, it is important to design appropriate resources, technology and program deployment (Kumar, 2014; Chen *et al.*, 2022) to ensure that there are no weak links unresolved by the quality assurance plan in an SC or poor control in the interface among different standards along an SC (Manning *et al.*, 2006). Excellent quality practitioners may pay attention to developing and implementing these pre-requisite plans to improve compliance with agri-food quality and safety requirements (Kheradia and Warriner, 2013).

4.3.1.4 Quality certification. Through official certification, the degree of trust in a final product can be improved (Song *et al.*, 2017) and the traceability of the food SC can be especially improved because of the records related to product production contained in the certification system (Migone and Howlett, 2012). Stranieri *et al.* (2017) explored the relationship between the motivation leading to the adoption of quality certification by agricultural companies and the types of voluntary traceability implemented to comply with such requirements. Whether agricultural companies can obtain certification is affected by the enterprise scale, export market, level of understanding of trade standards and market diversification level (Masakure *et al.*, 2011).

However, research on the frequent major agri-food safety events in recent years has revealed that many quality certifications have evolved into signs and gradually become signs of "You have all I have" (Ubilava and Foster, 2009). The due quality information transmission function, which also involves the management of the third-party certification authority, is limited (Albersmeier *et al.*, 2009). The value of the agri-food certification system lies in the market signal required by the production exchange. This system not only helps buyers to correctly select agri-food products but also helps suppliers to better distinguish their products from those of competitors. Therefore, it is necessary to ensure the authenticity and authority of the certification information. In this regard, governments have a key role to play not in promoting the certification process but in providing institutional and policy conditions (Ubilava and Foster, 2009; Masakure *et al.*, 2011).

4.3.2 Quality optimization

Self-adjustment within an SC is equally important (Rong *et al.*, 2011). Because of the structural complexity of the agri-food SC and the credence of food, it is necessary to pay attention to changes in the control parameters of an agri-food SC, such as the improvement of the relationships between SC members, the transmission of food safety trust and the change in the trust environment (Rijpkema *et al.*, 2016; Keizer *et al.*, 2015, 2017). Different network designs lead to different transportation, storage, processing, times and conditions. Van der Vorst *et al.* (2009) embedded a food quality change model and sustainability index into a discrete event simulation model to provide a new method to analyse and redesign food SCs. Nakandala *et al.* (2016) studied cost and quality optimization under the multi-product mixed loading scenario from farms to retailers. Furthermore, different network structures have different degrees of quality fading (Keizer *et al.*, 2017). Hence, Keizer *et al.* (2015) proposed a model and hybrid optimization simulation method to determine the food quality requirements under a cost-optimized network design (i.e. equipment location and process allocation).

In the case of uncertain supply, to make products of differing qualities meet the preferences of the end market, Rijpkema *et al.* (2016) used historical product delivery quality data to design a slaughterhouse distribution plan, fully considering the inherent quality differences between animals from different farmers, to reduce the uncertainty of the quality of received livestock. Furthermore, the scenario-based model is used to model the variability of delivery quality and to weigh the risks of transportation costs and shortages of supply livestock quality (Rijpkema *et al.*, 2015). In addition, considering the impact of mixing different grades of products, Ge *et al.* (2015) proposed effective wheat quality detection strategies in complex operating and regulatory environments.

4.3.3 Quality traceability

Quality traceability systems are seen as one of the most certain approaches to ensure food quality in the production of agri-food (Dios-Palomares and Martínez-Paz, 2011). Traceability refers to "a part of logistics management that captures, stores, and transmits adequate information about a food, feed, food-producing animals or substances at all stages in the food supply chain so that the product can be checked for safety and quality control, traced upward, and tracked downward at any time" (Bosona and Gebresenbet, 2013, p. 35). Traceability itself does not change the safety and quality of agri-food, but it provides the information and keeps track of products during all stages of production, processing and distribution (Regattieri *et al.*, 2007). Traceability also has the functions of monitoring the food production process and food flow, identifying food safety problems, implementing food recalls and fundamentally preventing food quality risks (van Rijswijk *et al.*, 2008).

A variety of technologies – including radio frequency identification devices, DNA barcoding, biochemical tools, blockchain, and others – are used and can be highly efficient in improving agri-food quality traceability (Migone and Howlett, 2012; Hu *et al.*, 2013; Feng *et al.*, 2020). However, because of a lack of complete and systemic knowledge of pre-warning decisions, the current traceability system cannot accurately delimit the range of abnormalities (Zhang *et al.*, 2011a, 2011b). Therefore, Zhang *et al.* (2011a, 2011b) proposed a pre-warning system in the quality traceability system for abnormalities to detect different types of abnormalities in the food production SC, especially hidden problems.

4.4 Agri-food supply chain quality performance

The performance measurement facet is also receiving more attention in the literature on agri-food SCQ (Siddh *et al.*, 2017; Soares *et al.*, 2017). Agri-food SCQ is more complex because of the QSs to be followed (Van der Vorst and Beulens, 2002), high uncertainty (Rijpkema *et al.*, 2015), costs and dependency on climatic conditions. Therefore, SCQ relies considerably on collaboration and coordination (Fernandes *et al.*, 2017), food safety and supplier management (Siddh *et al.*, 2015), monitoring decay parameters (Keizer *et al.*, 2017), monitoring physical conditions "from farmland to table" (Ringsberg and Mirzabeiki, 2014) and failure analysis (Kumar, 2014; Bertolini *et al.*, 2006). Indeed, SCQ emphasizes practices or exercises that stress continuous process advancement. However, very few studies have empirically examined the multi-dimensional performance attributes of product quality in the context of SCQM (Soares *et al.*, 2017).

An integrated performance measurement system for agri-food SCQ enables the assessment and propagation of uniformly adopted quality practices in a complete agri-food SC. Therefore, SCQ performance entails agri-food quality and SC reliability. Agri-food quality is measured as "up to standards" and "conforms to customers' requirement" (Juran, 1993). Reliability is a fundamental attribute for the safe operation of an agri-food SC (Tanik, 2010) because of variations in quality (i.e. some of the components not conforming to the QSs) and link vulnerability. Focusing on quality safety, reliability analysis aims at the quantification of the probability of failure of the system and its protective barriers (Zio, 2009). SC reliability is characterized by perfect order fulfilment and reliable coordination (Gunasekaran *et al.*, 2008).

5. Discussions

In this section, we intend to synthesize the thematic findings and develop a conceptual model that connects SCQM practices, SCQ dynamic capabilities (i.e. quality coordination, process control and quality learning) and agri-food SCQ performance based on the hierarchy of dynamic capabilities theory.

5.1 Hierarchy of supply chain quality dynamic capabilities

Linking back to Section 2.2, we have identified SCQC capabilities and SC process control capabilities in the reviewed papers discussed in Sections 4.2 and 4.3 (Table 5). We did not find any papers explicitly discussing SC learning capabilities, however learning is an intangible strategic resource in SCs (Biotto *et al.*, 2012). We therefore discuss the three levels of SCQ dynamic capabilities in turn.

5.1.1 Supply chain quality coordination capabilities

SCQC has become an important way of improving the quality of products and processes (Huo *et al.*, 2014). SCQC considered as basic ordinary dynamic capability (Table 2) is defined as "the degree to which an organization's internal functions and external supply chain partners strategically and operationally collaborate with each other to jointly manage intra- and inter-organizational quality-related relationships, communications, processes, etc." (Huo *et al.*, 2014, p. 39), which linked back to Section 4.2. Zhang *et al.* (2011a, 2011b) provided a retrospective synopsis on SCQC to promote further exploitation on the quality coordination research in SCs. It is necessary to coordinate and allocate resources among members and unify their quality ideas (Groot-Kormelinck *et al.*, 2021; Yan *et al.*, 2017). Internal inter-related process coordination help companies improve their operational effectiveness and efficiency along SC (Sroufe and Curkovic, 2008; Wiengarten *et al.*, 2013). The common features found in the literature include information sharing (Disny and Towill, 2003; Sanders, 2008), collaborative decision-making (Tsay, 1999; Aviv, 2001; Groot-Kormelinck *et al.*, 2021) and incentive alignment (Mowat and Collins, 2000; Stranieri *et al.*, 2016; Chen, 2019).

5.1.2 Supply chain process control capabilities

The main control activities of this level include QSs and quality certification, traceability implementation and quality optimization linked back to Section 4.3. In the entire "farmland to table" process, through the quality and safety management of forward supervision and reverse traceability of the SC business process, the results are fed back to the corresponding personnel at the corresponding nodes for correction and optimization. These activities constitute a closed-loop process based on SCQM. In this process, SC members restrict and

Table 5 Source of variables

Variable	Details	Source/References
SCQM practices	Intra-SCQM practices Inter-SCQM practices	*Section 4.1* Hong *et al.*, 2020; Zhang *et al.*, 2019; Gaudenzi *et al.*, 2021; Zhang *et al.*, 2020; Song *et al.*, 2017; Fu *et al.*, 2020; Chen *et al.*, 2014
SC quality coordination capability	Quality coordination in agri-food SC , that is, information sharing, incentive alignment and collaborative decision-making	*Section 4.2* Yan *et al.*, 2017; Zhao *et al.*, 2021; Zhang *et al.*, 2017; Borrás and Toledo, 2007; Wever *et al.*, 2010; Rijpkema *et al.*, 2016; Kirezieva *et al.*, 2016; Fu *et al.*, 2020
SC process control capability	Quality assurance, standard and certification Quality optimization Quality traceability	*Section 4.3* Luai and Ihab, 2013; Kuo and Hsiao, 2021; Sperber, 2005; Groot-Kormelinck *et al.*, 2021; Bertolini, 2006; Haq and Boddu, 2014, 2015; Morgan and Dewhurst, 2008; Macheka *et al.*, 2017; Manning *et al.*, 2006; Lao *et al.*, 2011; Aung and Chang, 2014; Miguel and Bruce, 2007; Kheradia and Warriner, 2013; Masakure *et al.*, 2011; Migone and Howlett, 2012; Stranieri *et al.*, 2017; Rijpkema *et al.*, 2016; Keizer *et al.*, 2015, 2017; van der Vorst *et al.*, 2009; Keizer *et al.*, 2015, 2017; Nakandala *et al.*, 2016; Rijpkema *et al.*, 2016; Jansen-Vullers *et al.*, 2003; Feng *et al.*, 2013, 2020; Xiao *et al.*, 2015; Zhang *et al.*, 2011a; Aung and Chang, 2014; Kher *et al.*, 2010; Wang *et al.*, 2017; Faisal and Talib, 2016
SC quality learning capability	Exploration learning on quality Exploitation learning on quality	Defee and Fugate, 2010; Gillies, 2015; Gosling *et al.*, 2016; Mellat-Parast, 2013; Yang *et al.*, 2019;
SC quality performance	Agri-food quality SC quality reliability	*Section 4.4* Siddh *et al.*, 2017; Soares *et al.*, 2017; Fernandes *et al.*, 2017; Anders Ringsberg and Mirzabeiki, 2014; Kumar, 2014; Bertolini *et al.*, 2006; Soares *et al.*, 2017

supervise each other; comprehensively guarantee agri-food quality and safety by feedforward, in-process and afterwards; and continuously improve to gain the ability and skills needed to quickly adapt to changes in the external environment (Antony *et al.*, 2008). Considered as dynamic functional capabilities (Table 2), SC process control capabilities are jointly constructed by the core and member organizations in an SC. They have path dependence and are embedded in companies as well as their SCs (Defee and Fugate, 2010).

5.1.3 Supply chain quality learning capabilities

Referring to Yang *et al.* (2019, p. 200), SCQ learning is defined as "the exploitative and exploratory capabilities of SC members to develop and share knowledge and solve SC problems on quality among multiple SC members, ultimately improving other dynamic capabilities and enhance supply chain quality performance from a dynamic capability perspective." SCQM practices should be able to develop processes that improve inter-organizational learning (Mellat-Parast, 2013). Sila *et al.* (2007) contended that SCQ has not been effectively practiced in spite of the fact that organizations acknowledge the importance of SCQ. There may be lack of emphasis on inter-organizational learning practices (Sila *et al.*, 2007). Through focus on learning, knowledge creation and processes innovation, the quality movement was able to address the adaptability of the organization in highly uncertain and changing environments (Sitkin *et al.*, 1994). Learning is developed and maintained by existing standard procedures, practices and rules (Hedberg, 1981). As such, the implementation of quality management programs that prescribe specific policies and procedures (e.g. total quality management, QSs, GAPs) facilitates the development of learning processes.

Learning capability includes "effectively identifying new skills and resources to pursue, the ability to explore these new areas, and the capacity to learn from that exploration" (Sitkin *et al.*, 1994, p. 546). Both exploration learning and exploitation learning are considered complementary rather than competing processes (Nissen, 2005), which contribute to quality innovation generation in the SC context (Jean *et al.*, 2012). For instance, the introduction of prior knowledge can help to achieve better generalization results (Flach, 2012), establish standard quality data sets, promote the data integration and sharing of agri-food SCQ (Kane and Alavi, 2007), help to realize the whole process quality traceability from planting, processing, storage and transportation, transaction to consumption (Ben-Daya *et al.*, 2021) and actively respond to the needs and preferences of consumer groups.

5.2 Conceptual model

Recent studies on agri-food SCQM have suggested that companies might need to establish cooperative relationships with SC members for managing their product quality (Stranieri *et al.*, 2016; Hong *et al.*, 2020; Zhao *et al.*, 2021). Through effective inter- and intra-quality management practices, close coordination of SC can be achieved, quality certification can be met (Song *et al.*, 2017) and managing the processes can be further strengthened (Kayikci *et al.*, 2022; Tenorio *et al.*, 2021). This reduces the information asymmetry about suppliers' process quality performance and capability (Zu and Kaynak, 2012) and establishes information sharing and agri-food traceability. Additional, dynamic SC capabilities are inimitable and irreplaceable resources to the SC members that can lead to sustainable competitive advantage (Hou *et al.*, 2015) and a more responsive, adaptive and ultimately better-performing SC (Defee and Fugate, 2010). Therefore, from a hierarchy of capabilities perspective, we develop a set of propositions, which are shown in the conceptual framework in Figure 3. The details are discussed in the following sections.

5.2.1 Relationship between supply chain quality dynamic capabilities

The method to effectively improve agri-food quality management largely depends on the level of cooperation (Manos and Manikas, 2010). For example, the premise of using a quality traceability system is to realize cross-department/company interaction in practice (Engelseth, 2009). That is, the implementation of SC process control is inseparable from the guarantee of SC coordination (Kaynak and Hartley, 2008; Zheng *et al.*, 2021). Additionally, process control capabilities are conducive to node companies establishing a mutually beneficial dependence relationship and reducing opportunistic behaviour and uncertainty in SCQC (Kaur *et al.*, 2019).

The standardized production of agri-food, with unified standards and unified production procedures, is not only conducive to improving process control capabilities but is also convenient for learning and replication, learning effects and demonstration effects (Lambrechts *et al.*, 2012). Additionally, SCQ learning capabilities reduce the costs for companies to obtain information and knowledge on quality, increase the degree of trust and communication density between SC members and make SC coordination smoother (Lyu *et al.*, 2020).

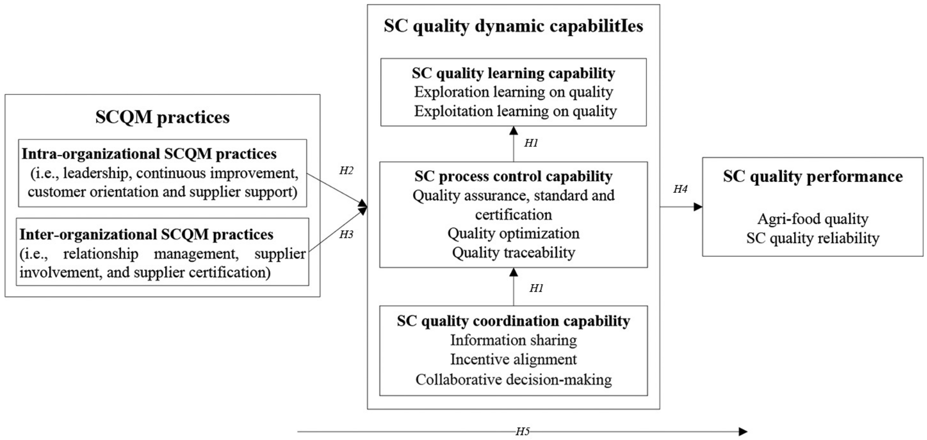
In general, both process control and continuous learning are inseparable from the coordination of an SC. SC coordination can improve the process control level through sufficient and accurate information communication among SC members (Voigt and Inderfurth, 2011). And the process control is the knowledge fermentation process that can effectively promote the learning and transfer of knowledge (Muthusamy, 2005). These capabilities are organically combined and not simply stacked. They are interdependent, are interactive and interact to form a whole. The lack of any one capability will affect the realization of quality objectives. Therefore, we propose the following:

Proposition 1: The SCQ dynamic capabilities of different levels affect each other; SCQC capabilities are the basis for developing SC process control capabilities, which in turn are the basis for developing SCQ learning capabilities.

5.2.2 Intra-organizational supply chain quality management practices and supply chain quality dynamic capabilities

Companies that have quality management practices in their SCs are more likely to have superior SC dynamic capabilities (Dangayach and Deshmukh, 2001). The basic elements of internal quality management practices (e.g. total quality management) are categorized into leadership, continuous improvement, customer orientation and supplier support (Mehra *et al.*, 2001).

Figure 3 Conceptual framework



Notes: SCQM denotes supply chain quality management, SC denotes supply chain

Leadership is the driving factor of capability formation (Gillies, 2015; Chen *et al.*, 2021). It has a decisive impact on managing the quality process within a company and in an SC (Yeung, 2003). Leadership, thus, can extend the effective quality management method from an intra- to inter-organizational level (Kuei *et al.*, 2011). It creates a learning atmosphere, influencing SC learning (Gosling *et al.*, 2016) and improving coordination capabilities (Wisner *et al.*, 2019). Customer orientation means putting your customers' needs first, which is the premise of coordinating various processes and integrating internal and external resources to effectively improve company performance (including quality performance) (Wisner *et al.*, 2019). It promotes functions within a company and among SC members to form a relatively consistent quality management concept and improve SCQC capabilities (Huo, 2015). Customer orientation is conducive to the formation of learning capability (Loe and Ferrell, 2015). It can also promote the formation of unified process control and prevent the occurrence of safety incidents at the beginning of the pipeline (Grunert, 2005).

Companies should establish a business environment, which enables joint quality focus with suppliers because of the importance of a good incoming quality from suppliers. Supplier support can better coordinate the partnership between SC companies and improve the SC coordination capability (Lin *et al.*, 2005). It is conducive to the formation of information communication mechanism among SC members and improves dynamic learning capability. It can promote supplier involvement (Mehra *et al.*, 2001), which is essential for increases in quality through process improvements (Deming, 1981).

Continuous improvement is a planned and systematic improvement activity (Hepner *et al.*, 2004). It is a process of continuously enhancing learning capabilities to accumulate knowledge and increase improvement and innovation skills by continuously absorbing knowledge. Through continuous improvement, the core companies of an SC can form strong management abilities for SCQC so that SC members can have the abilities and skills to quickly perceive the environment (Antony *et al.*, 2008), innovate SC processes, continuously meet the needs of customers and improve the satisfaction of final customers (Baronienė and Neverauskas, 2015). Therefore, we form the following hypothesis:

Proposition 2: Intra-organizational SCQM practices have a positive correlation with SCQ dynamic capabilities.

5.2.3 Inter-organizational supply chain quality management practices and supply chain quality dynamic capabilities

The agri-food safety and quality in the final market is dependent on the quality and safety management at each stage of the SC (Young and Hobbs, 2002). This type of inter-organizational SCQM behaviour is accompanied by process control and improvement, as well as integration among SC members (Hammoudi *et al.*, 2009). Relationship management, supplier involvement and supplier certification are considered as external quality management practice.

Effective relationship management can support better coordination of an SC (Fynes *et al.*, 2005), promote the learning of quality knowledge among SC members (Moorman *et al.*, 1992), better monitor SCQ (Loe and Ferrell, 2015) and improve SC process control capabilities. Agri-food companies need to develop stringent monitoring and control systems to ensure that the entire SC is standardized and controllable (Goetsch and Davis, 2009). A supplier's involvement in an organization's product development helps the organization improve quality-related performance directly. The supplier's certification can provide information about agri-food quality for downstream customers (Song *et al.*, 2017; Chen *et al.*, 2021), decrease its opportunistic behaviour and any product recalls of the materials it provides (Huo *et al.*, 2014) and ensure high-quality agri-food for the organization. Effective external quality management can further ensure the sharing and transfer of the latest state-of-the-art technologies and technical and managerial expertise (Schoenherr and Swink, 2015). It can also promote the generation of spill-over effects (Agrawal *et al.*, 2006), allow companies to conduct more efficient learning (McEvily and Marcus, 2005) and promote the dynamic learning capabilities of SCs (Wisner *et al.*, 2019). Hence, we propose the following:

Proposition 3: Inter-organizational SCQM practices have a positive correlation with SCQ dynamic capabilities.

5.2.4 Supply chain quality dynamic capabilities and supply chain quality performance

SC dynamic capabilities positively affect operating performance including quality performance. SC coordination capabilities play a positive role in resource integration and sharing and process coordination (Wiengarten *et al.*, 2013). These are inimitable and irreplaceable resources to an organization that can lead to sustainable competitive advantage (Hou *et al.*, 2015). The greater the SC coordination capabilities are, the better the quality performance of SC members (Harrison and New, 2002). If suppliers and farmers are effectively integrated, managing the production processes can be further strengthened. This reduces the information asymmetry regarding suppliers' process control capability (Zu and Kaynak, 2012). The SC process control capabilities can make the internal operation process of the SC more optimized which in turn improves the SCQ performance. For example, through food traceability system, quality and safety issues can be avoided and this is translated into higher performance (Tang *et al.*, 2015). Any transformation of external resources into final performance requires a series of processes, such as selection, absorption, internalization and externalization. SCQ learning can facilitate the appearance of new knowledge in an SC and therefore, compensate for the deficiencies and omissions of knowledge on quality. In this process, the more sufficient quality knowledge sharing is, the more conducive it is to the improvement of dynamic learning capabilities to improve quality performance (Wisner *et al.*, 2019) and customer satisfaction (Brown *et al.*, 2019). Therefore, we posit the following:

Proposition 4: SCQ dynamic capabilities have a positive correlation with SCQ performance.

5.2.5 Mediating role of supply chain quality dynamic capabilities

SCQM practices can improve the management efficiency of companies in an SC (Kaynak and Hartley, 2008) and positively promote quality performance (Soares *et al.*, 2017). Hong *et al.* (2020) verified that food SCQM practices have a significant positive impact on quality safety performance. On the one hand, intra-organizational SCQM practices meet the requirement of product quality certification which can exhibit better process control capabilities for controlling safety and quality of food (Song *et al.*, 2017). In the agri-food industry, if a firm has a high level of intra-SCQM, stakeholders will have a better perception of the firm's coordination capabilities and quality control capabilities (Walker, 2010). Inter-organizational SCQM, on the other hand, can exhibit a high level of operational and quality-related efficiency throughout the SC through SC coordination capabilities and SC learning capabilities (Zu and Kaynak, 2012). This enhances the traceability of product quality, achieving a high level of quality management standard (Hoejmose *et al.*, 2014), along with meeting the requirement of food safety and quality certification (Sanfiel-Fumero *et al.*, 2012), and then improving SCQ performance (Vanichchinchai and Igel, 2011; Wisner *et al.*, 2019). Therefore, we posit the following:

Proposition 5: SCQ dynamic capabilities play a mediating role between the relationship of SCQM practices and SCQ performance.

Finally, the relations and propositions are shown in the conceptual framework (Figure 3).

6. Future research directions

Based on above discussion and thematic findings, this section proposes some research directions on the topic of achieving superior quality performance in an agri-food SC that deserve attention from future researchers based on the thematic findings and conceptual framework.

Firstly, although QM practices can be effectively extended to agri-food SCs, especially the agri-food SCs dominated by leading companies (Rice and Caniato, 2003; Song *et al.*, 2017), the quality control of the source (e.g. farmers) or the link between SC members poses a major challenge to agri-food SCs. A "systems-based and holistic approach (e.g. high-order system approach, state system method in quality engineering field) to performance improvement (Foster, 2008, p. 461), which captures environmental dynamics" is worthy of further research. For example, the complexity of relational resources in a national context affects the development of SC dynamic capabilities in the long run. Specifically, we can explore how leadership, management culture of trust or autonomy in agri-food companies in a specific country affect the development of dynamic capabilities, or consider the contingency role of institutional environment with national characteristics between agri-food SCQM and SC dynamic capabilities.

Secondly, agri-food SCQM studies are dominated by empirical research (including both case studies and surveys). Such studies provide abundant case-based evidence and provide statistical data to test hypotheses, but behaviour experiment and simulation is also needed to provide more logical, objective and repeatable explanations, which is widely adopted by OR researchers in the SC and QM fields. For example, using a computer simulation, Coen and Maritan (2011) modelled a process of firms competing in factor markets for opportunities to invest in existing dynamic capabilities and acquire new ones. Then, simulation and experimental research can be used to deeply study the constituent elements, measurement system and boundary conditions of quality management practices and SC dynamic capabilities in the agri-food SC context.

Thirdly, under the background of digital technology adoption such as artificial intelligence, big data and cloud technology, grasping the changes of organizational learning mode and developing data-driven SC dynamic capabilities are important means for agri-food companies to deal with the rapidly changing environment and gain competitive advantage. However, "to date, no standard scale exists for measuring dynamic capabilities. This limits the comparability of empirical findings and impairs data-based theory development" (Kump *et al.*, 2019, p. 1149). Therefore, we can start from developing a relatively unified index measurement system of SC dynamic capabilities, which lay a solid foundation for the study of the relationship between variables. The development mechanism of data-driven SC dynamic capabilities in agri-food SCQM is worthy of further thinking and research.

Fourthly, there is a lack of adoption of theories underpinning the agri-food SCQM. Most of studies are primarily descriptive (Table 4) and are not theory driven. Such deficiency has impeded theory development of agri-food SCQM. Future research could apply social or organizational study theories and develop middle-range theories in agri-food SCQM such as organizational learning, resource based review and reliability theory. For example, in this study, we adopted dynamic capabilities as the underpinning theory to explore the research question. The integration of an SC and dynamic capabilities is a new research direction (Lee and Rha, 2015). We suggest that future research explore the different levels of SCQ dynamic capabilities using grounded theory and the relationship between them adopting empirical methods (e.g. survey or secondary data analysis).

7. Conclusion

The purpose of this paper is to contribute to the understanding of agri-food SCQM with the goal of achieving superior quality performance. By evaluating the relevant literature about agri-food SCQM practices, agri-food SCQC and agri-food SC process control and further discussing the question from the perspective of SC dynamic capabilities, we have developed a conceptual framework with five propositions that are capable of addressing the two research questions laid out in the introduction.

Firstly, the framework is comprised of agri-food SCQM practices, SCQ dynamic capabilities and SCQ performance with various relationships between them. The framework fosters an understanding of the implications of agri-food SCQM practices and other process control methods for quality performance.

Secondly, this study may be the first to explore the relationships between agri-food SCQM practices and SCQ performance from a hierarchy of capabilities perspective, that is, SCQC capabilities, SC process control capabilities and SCQ learning capabilities. These capabilities are the manifestation of dynamic capabilities in the SC context. They are the self-organizing capabilities needed by an SC to adapt to the external environment. These capabilities have injected new thinking into the mechanism of SCQM acting on quality performance. The line of arguments significantly enriches the literature on agri-food quality management in the SC context integrating different levels of analysis (i.e. low order and high order).

Overall, our paper makes three theoretical contributions. Firstly, this may be the first study to systematically investigate the topic of agri-food SCQM identifying SCQM practices and consequences of SCQM. Secondly, adopting the dynamic capability perspective, this study considers intra- and inter-organizational SCQM practices as drivers and SCQ dynamic capabilities as mediating variables; ultimately, SCQ dynamic capabilities improve SCQM performance. This line of arguments significantly enriches the agri-food SCQM literature integrating different levels of analysis (i.e. at firm level and at SC level). Thirdly, based on the comprehensive literature review, we suggest actionable future research directions for future agri-food SCQM research.

From a managerial point of view, this literature review could potentially help managers in agri-food companies to understand the strategic importance of SCQM. In particular, this research could improve managers' awareness on how to develop SCQM practices and SCQ dynamic capabilities. The proposed performance could assist practitioners in being aware of the importance of agri-food SCQM and find new ways of achieving superior quality performance. The framework can support managers' decisions and assist them to develop competence plans for the future.

This study has limitations. Our framework is developed through evaluating relevant literature and developing a conceptual framework based on the selected theoretical lens (i.e. dynamic capabilities), so the conceptual model may not represent all the complexities in reality. Therefore, further empirical work (e.g. a case study) is needed to refine and validate the framework.

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