

Analysis of Influencing Factors of Agricultural Product Quality Safety on Supply Chain Resilience

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ABSTRACT

In the context of global trade and food safety, the quality and safety of agricultural products has become a key factor affecting the stability and sustainability of agricultural supply chains. With the continuous improvement of consumers' pursuit of a healthy lifestyle and the strict requirements of national policies on the quality and safety of agricultural products, ensuring the quality and safety of agricultural products from field to table has become a top priority in supply chain management. In this context, this paper takes "Analysis of factors affecting the quality and safety of agricultural products on supply chain resilience" as the theme, and makes a systematic review of relevant literature. Firstly, through the review and analysis of relevant domestic and foreign literature, this paper deeply understands and defines the concepts of agricultural product quality safety and supply chain resilience. On this basis, the domestic and foreign literature on the quality and safety of agricultural products and supply chain toughness were reviewed. Through in-depth analysis and research of relevant literature, the conclusion of this paper is that the impact and disruption of agricultural product quality and safety will have an impact on supply chain resilience. In summary, this paper aims to reveal the important position of agricultural product quality safety in supply chain resilience through the literature review of agricultural product quality safety and supply chain resilience, and provide new perspectives and ideas for future research.

KEYWORDS

Quality and safety of agricultural products; Supply chain resilience; Influencing factor

1. INTRODUCTION

In the current context of globalization and digitalization, the resilience of agricultural supply chains is particularly important. Supply chain resilience is not only related to the quality and safety of agricultural products, but also the key to the stable operation of agricultural economy. With the increasing consumer awareness of food safety and the impact of global climate change on agricultural production, it has become an urgent and important topic to study the resilience of agricultural supply chain and its influencing factors from the perspective of agricultural product quality and safety.

The study of supply chain resilience in the context of food safety is a new research field, and related research is limited. Among the literatures collected, Alban, Hasler, Nielsen, and Ruegg were the first to explore the supply chain resilience of agricultural products focusing on food safety. Alban et al. (2017) take the pork supply chain as an example, through monitoring, inspection system, risk analysis and risk reduction measures including the use of private standards, the risk can be reduced to an acceptable level on the part of consumers and producers, and through the analysis of the three levels of events, patterns and structures and their complex interrelationships. Identify targeted prevention

activities to improve the long-term resilience of the agricultural supply chain [1]. W. Mu, E.D. van Asselt et al. (2021), taking the pork supply chain as an example, proposed a procedure for assessing the resilience of food safety, and evaluated the resilience of the supply chain from three dimensions: the time of the resilience factors, the impact of food safety shocks and the degree of recovery, so as to improve the resilience of the food safety supply chain [2]. To sum up, the literature on the study of supply chain resilience focusing on food safety is very limited, but the study of the above literature provides important research ideas for my paper.

Therefore, from the perspective of agricultural product quality safety, this paper explores and analyzes the relationship between agricultural product quality safety and agricultural product supply chain by combing literature, and reveals the influencing factors of agricultural product quality safety on supply chain resilience. This study aims to provide valuable reference for the research in this field, and has important practical significance for improving the ability of supply chain to cope with emergencies, ensuring food safety and maintaining social stability.

2. OVERVIEW OF AGRICULTURAL PRODUCT QUALITY SAFETY AND SUPPLY CHAIN RESILIENCE

2.1. Overview of Agricultural Product Quality and Safety

Caswell et al. (1998) believed that the safety of agricultural products is the quality attribute of agricultural products from the inside to the outside [3]. However, with the continuous attention of consumers to the quality and safety of agricultural products, the awareness and understanding of the quality and safety of agricultural products are also deepening. In 2023, in the "Law of the People's Republic of China on the Quality and Safety of Agricultural Products", the quality and safety of agricultural products are defined as the quality and safety of agricultural products reaching the quality and safety standards of agricultural products and meeting the requirements of protecting people's health and safety. Cao Yuehong (2008) believes that the quality and safety of agricultural products means that the production, processing, transportation, storage and other aspects should be carried out in accordance with safety standards, and consumers' consumption will not cause harm to human health [4]. Zhang Bei (2014) believes that the quality and safety of agricultural products refers to the components in products that do not harm human health [5]. Yin Chao (2022) believes that the nutrients, residual substances and external characteristics formed in the process of production, storage, circulation and use of agricultural products may have certain potential impacts on human health, and these factors need to be carefully evaluated and monitored to ensure the safety of agricultural products [6].

2.2. Overview of Supply Chain Resilience

The origins of the term "toughness" can be traced back to materials science, where it originally referred to "the ability of a material to return to its original shape after deformation without exceeding its ultimate load-bearing capacity." Over time, the concept of "resilience" has expanded into various fields, such as ecology and psychology, to describe the ability of different systems to adapt and recover in the face of challenges and changes. In the field of supply chain, although many scholars have conducted in-depth discussions on "supply chain resilience", a unified definition has not yet been formed. Next, I will sort out and summarize the scholars' overview of supply chain resilience.

The concept of "Supply Chain Resilience" (SCR) was first proposed by Rice and Caniato (2003), who believed that supply resilience refers to the ability to respond to and recover from any disruption in time [7]. Christopher and Peck (2004) defined supply chain resilience as the ability of the system to recover to the original state or a more satisfactory state within a certain range after the system is disrupted [8]. Pettit (2013) believes that supply chain resilience is an enterprise's ability to survive,

adapt and grow in the face of turbulent changes [9]. Ambulkar (2015) points out that supply chain resilience is the ability of enterprises to be alert to risk disruption, respond in time and react quickly [10]. Xiao Yongbo, Liang Yong (2023) et al proposed that supply chain resilience is the ability to resist the impact of major emergencies and recover quickly after shocks [11].

To sum up, it can be seen from the studies of existing scholars that it is not difficult to find that although the definition of supply chain resilience has presented diverse expressions in the academic community, the core focus is on its resistance and resilience in the face of supply chain disruptions. This paper mainly studies the resilience of agricultural product supply chain. Based on the above overview of supply chain resilience, this paper proposes a definition of the resilience of agricultural product supply chain: When major events break out, the agricultural product supply chain can respond in time and recover or even exceed the original operating state.

3. RESEARCH STATUS OF AGRICULTURAL PRODUCT QUALITY AND SAFETY

The quality and safety of agricultural products is a complex and multi-level issue, involving many nodes, including farmers, processors and consumers. This issue is not only related to the health and safety of consumers, but also has important implications for the sustainable development of the agricultural economy.

The quality and safety of agricultural products are affected by each node in the supply chain. According to the study of Hua Hongjuan et al. (2011), joining the supply chain organization, especially the cooperative mode, has a significant positive impact on the food quality and safety production behavior of grape growers in Jiangsu Province, and the production behavior of farmers under the cooperative mode is safer [12]. Wei Kaisuang et al. (2021) showed that consumers' cognition of quality attributes of livestock products and its impact on consumption, pointing out that consumers' cognition significantly affects their consumption behavior [13]. Wang F et al. (2022) proposed that in the supply chain of agricultural products, suppliers, processors and quality inspection departments demonstrate their decision-making process to ensure the quality safety of agricultural products through an evolutionary game model, which is affected by initial willingness, cost, penalty, consumer feedback and government supervision, among which the initiative of processors is most affected by initial willingness and cost of quality measures [14]. Xu J et al. (2022) believe that in the agricultural product supply chain, the quality upgrade led by the seller is more effective than that led by the producer in improving the quality and safety of agri-food and increasing the profit of the supply chain, while the centralized control decision is the most effective way to improve the quality and safety of agricultural products and the overall profit, and the cost-sharing contract can significantly improve the quality of agri-food. Achieve the goal of "high quality, low price" [15].

Supply chain coordination and integration is the key to ensure the quality and safety of agricultural products. Wu Qiang et al. (2020) analyzed the quality cooperative control behavior of supermarkets at the end of the supply chain through the structural equation model and found that the external environment had the greatest impact on the quality cooperative control of supermarkets [16]. Zeng Mengling (2021) believes that the quality coordination control of agricultural supply chain requires the cooperation of various stakeholders to enhance the quality and safety of agricultural products [17]. Zhao X et al. (2021) studied that in agricultural supply chain management, effective integration between internal and supplier becomes the key to improve product quality and safety through real-time monitoring of the entire production process [18].

The application of technology plays an important role in improving the quality and safety of agricultural products. Prashar et al. (2020) proposed that blockchain can monitor and manage all communications and transactions in the supply chain network through smart contracts, providing a safe and cost-effective supply chain system, realizing the transparency, accuracy and traceability of

the agricultural supply chain, and ensuring the quality and safety of agricultural products [19]. Zhu Z et al. (2021) studied the quality and safety of agricultural products based on 5G Internet of Things technology and found that this technology can improve the circulation efficiency and information transparency of agricultural products, thus improving the quality and safety of agricultural products [20]. Liu Xiaoli et al. (2023) analyzed the cooperative behaviors of e-commerce participants from the perspective of traceability of agricultural product quality and safety, and ensured the quality and safety of agricultural products by improving the quality control of agricultural products e-commerce, increasing the intensity of government supervision and punishment, and enhancing consumers' awareness of rights protection, and promoted the system to adopt a stable strategy of providing and selling high-quality agricultural products [21].

4. RESEARCH STATUS OF SUPPLY CHAIN RESILIENCE

Supply chain resilience plays a crucial role in responding to emergencies and complex environmental changes. This part reviews the research on supply chain resilience in recent years, and deeply analyzes the influencing factors of supply chain resilience from three dimensions: theoretical support, research methods and practical cases.

From a theoretical perspective, many scholars have used different theoretical frameworks to explain in detail the factors affecting supply chain resilience. Li Wei 'an and Ma Yin (2022) discussed multiple concurrent factors and causal mechanisms of supply chain resilience from the perspective of dynamic capability, and pointed out that high supply chain resilience requires the synergistic effect of dynamic capability and organizational actions [22]. Based on the perspective of complex system management, Sheng Zhaoan et al. (2022) emphasized the integrity and complexity of supply chain resilience in dealing with instability and risks [23]. Ke Y et al. (2023) explored the key elements of supply chain elasticity through grounded theory and found that product supply elasticity, resource elasticity, partner elasticity, information response elasticity, capital elasticity and knowledge elasticity have a positive impact on supply chain elasticity [24].

In terms of research methods, the exploration of supply chain resilience is also extensive and diversified. Soni et al. (2014) proposed a model using graph theory to evaluate the effectiveness of risk mitigation strategies by taking into account all major contributing factors of elasticity and their interrelationships, analyzing interpretative structural modeling methods as a whole and quantifying elasticity [25]. Fan Xuemei and Lu Mengyuan (2020) built a set of supply chain resilience evaluation index system based on five core dimensions of response ability, learning ability, forecasting ability, resilience and adaptation ability by using ISM model and entropy weight TOPSIS method, and evaluated the factors affecting the supply chain resilience of automobile enterprises under the epidemic situation. Suggestions are put forward to improve the supply chain crisis response ability [26]. Xu Haijuan et al. (2023) used ISM and cross-influence matrix multiplication to analyze the promoting factors of supply chain resilience and their hierarchical relationship [27]. Based on the DEMATEL-ISM model, Wang Hongchun and Chen Yawen (2023) studied the key influencing factors of the resilience of the prefabricated building supply chain, emphasizing the improvement of information sharing and logistics capabilities [28]. Al-swidi et Al. (2024) adopted partial least squares structural equation modeling (PLS-SEM) to test the impact of blockchain technology on supply chain elasticity, and analyzed the mediating role of supply chain integration and the moderating role of environmental dynamics [29].

From the perspective of specific case analysis, Zhu Lei et al. (2020) studied the supply chain resilience of prefabricated buildings and identified information sharing and transportation capacity of logistics enterprises as key influencing factors [30]. Ozdemir et al. (2022) studied the supply chain resilience of the UK perishable commodity market and found that supply chain speed is the preferred index to measure resilience, and innovation and empowerment can help organizations effectively manage supply chains during crises [31]. Zhang Yuhang (2023) constructed a model of factors affecting the

toughness of the prefabricated building supply chain and proposed improvement strategies [32]. In the enterprise case analysis, Zhou Jiaoyan (2023) proposed to build supply chain resilience from four aspects of supply chain reconstruction, collaboration, agility and risk management culture through the case of Shenzhou International, and analyzed the impact of supply chain resilience improvement strategies on enterprise performance [33].

5. RESEARCH STATUS OF AGRICULTURAL SUPPLY CHAIN RESILIENCE

Agricultural supply chain resilience refers to the ability of supply chains to maintain functional and structural integrity in the face of various internal and external shocks. The study of factors influencing the toughness of agricultural supply chain is helpful to improve the stability and sustainability of supply chain. This part will review the relevant literature from two aspects of internal and external influencing factors.

From the perspective of internal factors, it mainly includes supply chain informatization construction, supply chain collaborative innovation, agility, robustness, early warning ability, response ability, recovery ability, innovation ability, etc. Hernandez and Pedroza-Gutierrez (2019) studied the impact of network topology on the agility of food supply chain and found that network structure optimization can help improve the agility of supply chain [34]. Dong W (2020) used AHP-FCE method to evaluate the elasticity of agricultural supply chain and found that the elasticity evaluation is of great significance to supply chain management [35]. Zhang Ge (2020) studied the information construction of the supply chain of fresh agricultural products and the development of supply chain finance through the gray correlation degree analysis, and found that the information construction and supply chain finance had a significant impact on the supply chain resilience [36]. In addition, Qin Ligong and Zhang Yong (2021) pointed out that supply chain collaborative innovation can significantly improve the resilience of agricultural supply chain [37]. In the context of rural revitalization, Ma Xiaoya and Sun Limei (2023) studied the agility and robustness of supply chain and the impact of digital construction on resilience, and found that agility and robustness have positive effects on supply chain resilience [38]. Ren Yanjuan et al. (2023) built a toughness evaluation model of agricultural supply chain based on system dynamics to further verify the impact of design, operation and recovery links of supply chain on resilience [39]. In addition, Qu Ying and Wang Jiaqi (2023) studied the influence of economy, customer relationship, logistics, product quality, technology and other factors on the resilience of supply chain through meta-analysis and found that these factors all play an important role in the resilience [40]. Qu Ying and Duan Zhen (2023) analyzed the influences of regional culture, price fluctuations, economic environment and agricultural product quality on supply chain resilience, and proposed strategies to improve supply chain resilience [41]. Hao Li and Pei Xueying (2023) used entropy weight -TOPSIS method to study the impact of supply chain's early warning ability, response ability, recovery ability and innovation ability on the supply chain resilience of fresh agricultural products, and found that the improvement of these capabilities helps to enhance the supply chain resilience [42]. Song Haicao et al. (2023) identified and analyzed the influencing factors of supply chain resilience network, and proposed a path for improving resilience from the perspective of network [43]. Wang J et al. (2023) analyzed the factors affecting the resilience of green supply chain and proposed the grey-Dematel-ISM method to evaluate and improve the resilience of green supply chain [44].

From the perspective of external factors, Karakoc et al. (2023) studied the impact of structural bottlenecks on the resilience of the agri-food supply chain in the United States and found that structural bottlenecks are important constraints to supply chain resilience [45]. Ali et al. (2023) studied the impact of the epidemic on the resilience of small and medium-sized enterprises in the agri-food supply chain in different countries, found that the epidemic had a significant impact on the resilience of small and medium-sized enterprises in the supply chain, and put forward suggestions to

improve the resilience [46]. Tao Zheng et al. (2024) studied the impact of external shocks on the resilience of China's food supply chain and found that external shocks would significantly affect the stability and sustainability of the supply chain [47]. Zheng T et al. (2024) analyzed the impact of external shocks on the resilience of China's food supply chain and proposed strategies to deal with external shocks [48].

6. SUMMARY

This paper reviews the literature on agricultural product quality safety, supply chain resilience and supply chain resilience to explore how agricultural product quality safety affects the resilience of agricultural product supply chain. In view of the lack of literature directly exploring the relationship between the two, this paper attempts to establish a link between the two through a comprehensive analysis of existing studies. Through a comprehensive literature review, it is not difficult to find that there is a close relationship between the quality and safety of agricultural products and the toughness of agricultural supply chain. This connection is reflected in many aspects, such as information sharing, resource integration and supply chain integration. These factors play a vital role in the supply chain of agricultural products, which not only directly affect the quality and safety level of agricultural products, but also have a profound impact on the resilience of the supply chain.

Therefore, in future studies, we can start from the common factors such as information sharing, resource integration and supply chain integration, and deeply explore how they work together to improve the overall performance and resilience of the agricultural supply chain, so as to provide valuable references for improving the overall performance and resilience of the agricultural supply chain. The research of this paper not only helps to enrich the theoretical system of related fields, but also provides important reference and enlightenment for the practice of agricultural supply chain management.

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