

Study on the toughness of agricultural products industrial chain and supply chain

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Abstract

Agricultural products industrial chain supply chain is composed of farmers, agricultural cooperatives, agricultural products processing enterprises, logistics enterprises, wholesale markets and supermarkets, and the whole industrial chain from farmers to consumers. There are many links and long chains in the supply chain of agricultural products in China, the supply chain is greatly affected by the external environment, and the supply chain is interrupted or has poor recovery ability after interruption. Therefore, the study of the supply chain resilience of agricultural products industry chain is particularly important. From the point of view of research methods, the main use of literature and induction method. Literature data method is a method to obtain the required research content by searching relevant literature data. Induction method is a method to summarize the previous research results and use charts and other forms to reflect them. This paper uses the literature data method to summarize the research in related fields, aiming to provide some reference for the research in related fields.

Keywords

Agricultural products industrial chain, supply chain, the toughness.

1. Introduction

At present, domestic and foreign scholars mainly study the supply chain resilience of agricultural products from two aspects: first, the connotation, characteristics and influencing factors of supply chain resilience; The second is the evaluation method of agricultural supply chain resilience[1].

From the perspective of connotation, domestic scholars mainly discussed the definition, connotation and characteristics of supply chain resilience from three aspects, while foreign scholars mainly studied the connotation, influencing factors and evaluation methods of supply chain resilience [2]. Some scholars define supply chain resilience as "the ability of the system to maintain the original operating state or system structure after external disturbance", and put forward an indicator system to measure the resilience of agricultural supply chain, which includes four dimensions: system goal, subsystem goal, constraint condition and constraint index.

From the perspective of influencing factors, foreign scholars mainly analyzed the influencing factors from the perspectives of economy, society, technology and politics, while domestic scholars discussed the influencing factors from the aspects of economic environment, social environment, technological environment and political environment [3-5]. Domestic scholars mainly studied the evaluation methods of agricultural product industry chain and supply chain toughness, including principal component analysis and fuzzy comprehensive evaluation, and selected different indicators from the two evaluation methods for empirical analysis to verify the effectiveness of the evaluation method.

2. Definition of resilience

Resilience, first proposed by Georgi, a German geographer, refers to the ability of an organism to recover quickly after being hurt, that is, to maintain stability and even to deal with the problem when the organism is hurt. Haggard, a British geologist, was the first to study toughness. He proposed the term "toughness" to describe the deformation, fracture, recovery and recombination of rocks under stress. Since then, some scholars have made a distinction between "resilience" and "resilience"[6]. For example, Eisenhardt defined elasticity as the ability to deform and recover in a structural state; Korotkov uses the word "resilience" to describe the ability to react in a process of change. Friedman proposed the concept of toughness from the perspective of fluid mechanics, arguing that toughness is a "structural state" under the action of pressure and stress. Through the study of toughness theory, it is found that toughness theory can effectively explain many natural phenomena in nature. For example, an earthquake can be destructive, but it does not immediately destroy the building; When an earthquake occurs, the damage to a building decreases over time; After the earthquake, the deformation of the building will gradually recover; Buildings may be stronger when rebuilt after a certain amount of damage. It can be seen that toughness is a concept with dynamic and nonlinear characteristics, which refers to the ability of a system to maintain its original state or function unchanged or stronger after being disturbed by the outside world.

2.1. Definitions

At present, domestic and foreign scholars have not formed a unified view on the definition of resilience, mainly the following views[7-9].

One view is that toughness refers to the ability of a system or structure to have its original function or performance unaffected or even improved after being disturbed. To sum up, the current definition of resilience by domestic scholars mainly focuses on three aspects: First, resilience is a dynamic system.

Second, resilience is a macro concept. Combining the above views, it can be seen that toughness is not a property of a system or structure after interference, but a state or state characteristic[10]. Although different scholars have different definitions of toughness, it can be seen from the above three aspects that the current definition of

toughness mainly focuses on three aspects: First, it emphasizes a "structural state" of a system or structure after being disturbed.

Third, emphasize a "capability" that the system or structure exhibits. Through the summary of these views, it can be found that the current scholars' definition of resilience is more macro and macro combination. However, for different systems, their "states" are not the same.

2.2.Theoretical basis

In the system theory, the theory of toughness provides a new perspective for the study of system science. Therefore, the toughness theory can regard the system as a self-organizing system, which has its own characteristics and laws of evolution [11]. The concept of "self-organization" in system theory points out that a system from disorder to order is a gradual process, that is, the formation of self-organization. The process of self-organization is the process from disorder to order. The law manifested in the process of system self-organization is system toughness. Therefore, in system theory, resilience is regarded as the ability to adapt and self-repair due to the interaction between the intrinsic properties of a system and the external environment [12]. The concept of "adaptability" in system theory can also provide theoretical support for resilience theory. Adaptability refers to the ability of the system to adjust and change the external environment when facing the change of the external environment. Adaptability and adaptability are two different concepts. Adaptability refers to the ability of an individual to quickly adapt to a new environment in order to gain survival advantages. Adaptability refers to the ability of individuals to self-regulate and improve themselves in the changing environment to adapt to the new environment. Therefore, the theory of toughness can also get theoretical support from systems science.

In short, resilience theory provides a new idea for the explanation of natural phenomena and a new perspective for resilience theory through the research findings on self-organization formation rules and mechanisms in life science, ecology, cybernetics and other disciplines.

2.3. Main points

Resilience theory can help us understand the state of a system after external disturbances, and use this information to develop reasonable countermeasures, so that the system can maintain or improve the function of the system. The concepts of "elasticity" and "plasticity" mentioned in the toughness theory refer to the ability of the system to maintain the original state or function unchanged or stronger after being interfered with by the external environment. But resilience theory also states that resilience is a dynamic process that varies at different times and in different environments. Therefore, we can think that toughness is a dynamic process, which has nonlinear characteristics and dynamic properties. It can be seen that the theory of toughness is not a complete theoretical system, but a complex system theory

composed of multiple branches . Influencing factors of toughness.

3. Evaluation indicators of toughness

For the evaluation of supply chain resilience, scholars put forward different indicators from different perspectives. Some scholars use five indexes of node strength, average distance between nodes, network connectivity and average network width to evaluate supply chain toughness, all of which have certain representativeness and operability. However, some scholars believe that a single indicator may affect the evaluation of supply chain resilience.

The research on the resilience of agricultural supply chain mainly focuses on three aspects: "supply chain management", "supply chain security" and "supply chain organization", which reflects the attention to the resilience of agricultural supply chain from a macro perspective. From a micro perspective, some scholars believe that the toughness of agricultural product industrial chain and supply chain can be improved from the following aspects:

- 1) Establish a more efficient information transmission mechanism to improve the efficiency of agricultural product information communication[13];
- 2) Strengthen the cultivation of agricultural cooperatives and other related subjects to improve their anti-risk ability;
- 3) Strengthen the construction of agricultural product logistics system and improve its anti-risk ability;
- 4) Give play to the leading role of leading enterprises and improve the position of leading enterprises in the industrial chain and supply chain of agricultural products.
- 5) Strengthen the construction of agricultural products logistics system and improve its anti-risk ability;
- 6) Give play to the leading role of leading enterprises and improve their position in the industrial chain and supply chain of agricultural products.

4. Conclusion

The study focuses on the resilience of agricultural industry chain and supply chain, revealing its key characteristics and influencing factors. Through the analysis of the core links and management strategies of the supply chain, it is clear that resilience plays an important role in improving the stability of the supply chain and coping with uncertainty. Internal factors such as supply chain structure and management capabilities, as well as external factors such as market conditions and natural disasters, are important variables affecting resilience. Studies have shown that supply chain resilience can be effectively improved by optimizing supply chain management, especially by strengthening strategies such as collaboration and information sharing and risk management. In addition, digital technologies and innovation drive show significant potential to enhance the sustainability of supply chains.

The study provides a new perspective on supply chain management theory in the

field of agriculture, enhances the understanding of supply chain resilience building, and provides specific strategic guidance for practitioners. However, there are still a number of issues that deserve further discussion, such as the specific challenges in implementing resilience strategies for agricultural enterprises of different sizes, and the long-term effects of policy differences in countries on supply chain resilience. In addition, future research can focus on the application of emerging technologies in improving supply chain resilience, not only digital technologies, but also consider the potential of cutting-edge technologies such as artificial intelligence and blockchain to provide more support for the innovative development of agricultural supply chain management.

To build a truly resilient agricultural ecosystem, blockchain must be integrated with existing infrastructure and systems in a way that enhances rather than disrupts operations. This requires careful planning and strategic partnerships. Collaboration between tech giants, startups, government agencies, and agricultural cooperatives can lead to the development of comprehensive solutions that address the specific needs of diverse stakeholders.

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