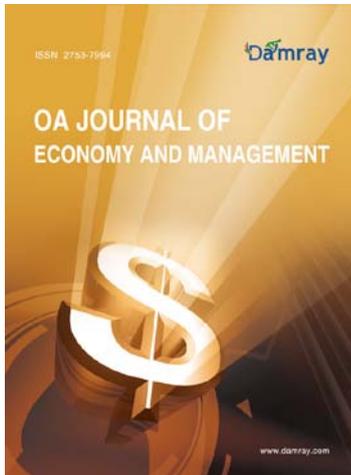


# Research on Income Distribution Mechanism of Agricultural Product e-commerce Supply Chain from the Perspective of Ecological



**Fengju Hou**

Zibo Vocational School, Zibo City, Shandong Province, 255300, China.

## Abstract

With the promotion of digital village strategy and "Internet+Agriculture", scientific implementation of income distribution of agricultural e-commerce logistics supply chain is of great significance for its ecological construction and operation. Focusing on the three major nodes of suppliers, e-commerce and logistics providers, the modified Shapley model is applied to make the income distribution of the ecological operation of agricultural e-commerce logistics supply chain more rational and scientific by introducing four major influencing factors, namely, resource contribution, implementation responsiveness, ecological input and risk prevention and control, appropriately modifying the weight of the influencing factors, constraints on the node comprehensive influencing factors and expert scoring judgment. In particular, the rationality of model modification is demonstrated through the verification of numerical examples. It shows that the application of the distribution scheme obtained by the model will effectively improve the stability and market competitiveness of the overall supply chain operation under the ecological cooperative game environment.

## Keywords

Income distribution of agricultural product e-commerce supply chain in the ecological perspective

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## 1. Introduction

With the efficient implementation of the national "rural revitalization", "digital village" and other major strategies, the whole process supply chain system of agricultural production, processing, logistics, marketing, services, etc., which is based on the "Internet+agriculture", has gradually covered rural areas. In particular, the implementation of the comprehensive demonstration project of e-commerce in rural areas, the promotion of the status of ecological circular agriculture, and the modernization of agricultural product quality safety and food safety supervision have further strengthened the important position of agricultural product e-commerce supply chain.

The agricultural product e-commerce logistics supply chain system has developed with the evolution of big data technology. According to the views of relevant scholars, it is possible to achieve the unification of agricultural product logistics, business flow and information flow by comprehensively, rapidly and accurately capturing the information of

the whole agricultural industry chain. By establishing an ecological e-commerce logistics and circulation system for agricultural products, a dynamic mechanism for the healthy and coordinated development of agricultural products up and consumer products down can be formed (Zhang Xingwang, 2017).

The agricultural big data platform widely collects the data of breeding, production, circulation, sales and other links, conducts standardized processing and cross validation, establishes an open data application platform, realizes the integration and sharing of massive data, real-time collection of multi-source data, and convenient data services, which is conducive to the information support of e-commerce logistics supply chain operation. As an important measure of industrial poverty alleviation, rural e-commerce should pay more attention to the collaborative operation of quality inspection, warehousing, distribution and other links to form a safe and convenient industrial chain and supply chain. The e-commerce logistics platform for agricultural products is conducive to promoting the development of "holding together for warmth", strong combination and agglomeration by building a "network+enterprises+farmers+associations" collaboration system and a supply chain node system. Many arguments show that big data and information flow enhance the aggregation function of e-commerce platforms, but the high-quality play of platform scale benefits must also rely on the supporting and healthy development of its logistics supply chain system (Zhang Xingwang, Meng Li, & Du Shaoming, 2017).

## **2. Influencing factors of profit distribution in agricultural product e-commerce supply chain**

### **2.1 Resource contribution**

The development of modern agriculture needs to be deeply integrated with the modern service industry. Through the channels and platforms of the modern service industry, the products of modern agriculture will be introduced in a timely manner to form a high-quality channel. The professional supply chain built with agricultural product suppliers, e-commerce and professional logistics providers as the core will be an effective manifestation of such channels. To make this form more effective, we must establish strong resource support. According to the input-output law of economics, paying attention to the resource contribution of each node of the supply chain in the construction and operation of the professional supply chain will not only help to improve the construction level of the node, but also promote the optimization of the overall level of the supply chain (Li Jin & Gu Geqi, 2017).

Based on the analysis of the current situation of new rural construction, the construction foundation of agricultural product supply chain is not solid enough due to the short construction time, especially the need for a large amount of resources. In order to encourage node enterprises to consciously incline resources to the development of such supply chains, it is necessary to take resource contribution as a key factor to consider when allocating benefits. Under the cooperative game thinking, it is necessary to establish the overall development view of the supply chain operation. Only when each node takes an overall consideration in the input decision, can the overall competitiveness of the supply chain be continuously enhanced. According to the basic incentive principle under the market economy system, when the resource contribution of a node increases, its income distribution rate must also get its equivalent share. Therefore, in the process of applying Shapley model to evaluation design and calculation, resource contribution should be considered as the primary constraint.

### **2.2 Execution responsiveness**

Ecological agricultural product supply chain must be the coordination and collaboration between nodes. According to the rapid response characteristics of logistics, its implementation response must be immediate. For the specialized supply chain of agricultural products, its resource input is fundamental at the initial stage of construction. Once the supply chain operates normally, its executive responsiveness represents the executive power of the supply chain operation. To a certain extent, execution determines the success or failure of supply chain operation. Because no matter how good the hardware construction is, no matter how strong the high-level decision-making is, if there is no quick response from the middle level and the grassroots, the competitiveness of the whole supply chain will be impossible to talk about. The execution responsiveness is not only the display of node hardware, but also the embodiment of node software strength (Liu Tongde & Guo Zhen, 2016).

As fresh agricultural products account for half of the total agricultural products, the professional supply chain of agricultural products emphasizes the implementation responsiveness of each node. For suppliers, e-commerce platforms and logistics providers, the overall concept must be strengthened, especially for products with high requirements on the fresh and cold chain, they must respond to the time constraints in a timely and seamless manner. In the face of the specific time, place, quality and other requirements proposed by consumer customers, the nodes at all levels of the supply chain must cooperate with each other to ensure high-quality and efficient delivery. Therefore, in the distribution of ben-

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efits in the specialized supply chain of agricultural products, the implementation responsiveness must be taken as an important factor to improve the Shapley value.

### 2.3 Ecological input

Ecological input has two meanings here, one is the ecological nature of agricultural product quality, the other is the ecological nature of agricultural product supply chain operation. The ecological operation of the supply chain means that the supply chain nodes can form a good situation of coordination and collaboration in decision-making, operation, management and innovation. In particular, the ecological system and mechanism will give a strong impetus to the deep integration and development of modern agriculture and modern service industry (Fan Dan & Wu Liancui, 2018).

The ecological input of each node of the supply chain is strategic, which supports the development of the overall competitiveness of the supply chain. Ecological input can not be achieved overnight, and has a significant process. Ecological awareness is reflected in all aspects of supply chain node decision-making, operation and management, and its behavior habits need to be nurtured daily. In the context of the rapid implementation of the digital village strategy, the large database of the entire agricultural industry chain has been gradually established, and the ecological input of each node of the supply chain has also changed from abstraction to materialization. Therefore, the ecological input is becoming an important factor in the income distribution of the specialized supply chain of agricultural products.

### 2.4 Risk prevention and control degree

In the operation of agricultural product supply chain nodes, the decision-making and management of each node are also common sources of risk. The key is how to block the transmission of risk and reduce the loss of the whole supply chain through effective prevention and control once a node risk occurs. Risk prevention and control degree is a concept under the logic of risk co control at each node of the supply chain. The higher the risk prevention and control degree, the stronger the competitiveness of the supply chain operation, the lower the probability of supply chain operation interruption, and the more stable the income of the supply chain. For example, in the supply chain of agricultural products, due to the storage, circulation and processing of suppliers, storage, transportation and distribution of logistics providers, there are always situations that affect product quality due to time and space changes, e-commerce platforms also have the risk of timely payment recovery and financial settlement in bulk transactions, and logistics providers also have the risk of road accidents in the transportation process, Risk prevention and control is a risk factor that must be dealt with in the process of ecological operation of agricultural product supply chain (Hu Xiangyun, Wang Chengsong, & Liu Xiaohong, 2017).

In fact, the risk factor is one of the elements that people first modified and added when they used the Shapley value to distribute the supply chain income. Generally speaking, under the principle of joint risk control and risk sharing, the revenue of supply chain nodes is proportional to the degree of risk prevention and control they undertake.

## 3. Conclusion

With the implementation of the digital village strategy and the development of big data in the whole agricultural industry chain, the status of agricultural e-commerce supply chain is becoming more and more important. As the living standards of urban and rural residents continue to improve, the ecological requirements for the industrial chain and supply chain are also increasing. It is of great significance for the stability and high-quality development of supply chain construction to study the supply chain composed of three nodes of agricultural product supplier e-commerce logistics provider and its income distribution from the perspective of ecology.

Focusing on the three core nodes of suppliers, e-commerce and logistics providers, the research is carried out with four major elements that affect the ecological development of agricultural product supply chain, including resource contribution, implementation responsiveness, ecological input and risk prevention and control. By analyzing the four elements, it shows that the four elements have important influence in the ecological construction and operation of agricultural product supply chain.

By revising and improving Shapley model, the limitation of Shapley initial model in the process of income distribution is effectively remedied, which greatly promotes the enthusiasm of all stakeholders in the supply chain nodes to participate in investment, operation and management under the market economy environment. The research shows that the modified Shapley model is used for income distribution. First, by promoting the ecological cooperative operation of each core node of the agricultural product e-commerce supply chain, the business environment and product ecological quality awareness of the whole process are optimized and improved, and the loyalty cluster of consumers is effectively expanded. Its ecological cooperation income is far greater than the initial independent operation income. The second is the modified Shapley model. Through experts' judgment and scoring on the influencing factors, as well as many con-

straints and restrictions in the model operation process, the weight of the influencing factors of the ecological supply chain is more scientific, and the calculation results are more consistent with the actual state of the cooperative game.

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