

Research on Countermeasures for the Development of Green Supply Chain for Agricultural Products in Hubei

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Abstract

Although Hubei Province, known as the "Province of a Thousand Lakes," boasts a wide variety of agricultural products. Simultaneously, as a crucial national transportation hub, the development of its cold chain logistics significantly reflects the current development level and technological content of the circulation field. This paper employs the exponential smoothing method and multiple regression analysis to forecast the demand for agricultural products in Hubei Province over the next five years. A fitting analysis concludes that the multiple regression model offers the highest accuracy. Meanwhile, based on the indicators corresponding to the results of multiple regression analysis, a summary was made from three aspects: agricultural product consumption volume, goods turnover volume and per capita disposable income.

Keywords

Green Supply Chain, Agricultural Products, Hubei Province.

1. Introduction

In recent years, the rapid development of smart logistics technology has brought new development opportunities for the operation of the green agricultural product supply chain, which has also become a key driving force in promoting the process of agricultural modernization. China has also carried out a series of deployments regarding the development of smart logistics technology in agriculture, where legal and policy support are the core and foundation for the healthy and rapid development of smart logistics. However, there are still many obstacles to the development of China's smart agricultural product supply chain.

Driven by the "Belt and Road" Initiative and the Yangtze River Economic Belt, Hubei Province is gradually building a fully functional transportation industry chain. The government is also actively promoting the construction of large logistics hubs to further enhance the competitiveness of Hubei's agricultural industry.

However, factors such as a relatively late start, weak regional planning capacity in Hubei Province, uneven distribution of logistics regions, unbalanced development, inadequate basic technological infrastructure, low application frequency of IoT technology, and a lack of leading enterprises have led to a series of problems. These include difficulties in achieving traceability of agricultural products, high circulation damage rates, and significant challenges in government supervision.

2. Literature Review

Legal and policy support are the foundation for the rapid and healthy development of the green agricultural product supply chain, and the construction of its basic framework is key to its effective operation. Pei Yanpeng [1] believes that the green supply chain for agricultural products mainly includes three main operational processes: "green procurement," "green

production and processing," and "green logistics." Meanwhile, Jia Qiangfa [2], in his newly constructed circulation model for the green agricultural product supply chain, added two more operational processes: "green design process" and "green marketing methods." Together, these provide a relatively complete framework for the basic operational model of the green agricultural product supply chain. Furthermore, Wang Feng [3] and others implemented targeted measures based on the basic framework: "establishing green agricultural product production bases," "building green agricultural product collection, distribution, and processing centers," "creating a green supply chain management information platform," and "achieving green logistics and green marketing," greatly enhancing the success rate and efficiency of green agricultural product supply chain operations. Dechuan Geng [4] and others, taking the green agricultural product supply chain as the research object, built a performance evaluation indicator system from five aspects. Wang Muwen [5] and others proposed a new integration model, providing a useful tool for agricultural policymakers and sustainable development decision-makers. Li, Yue [6] and others constructed a system of influencing factors for the performance of the green supply chain for fresh agricultural products under a cloud logistics model. Feng, Yunting [7] and others, combining practical examples, discussed the concept and practice of the green supply chain system in the application of digital technology.

With the sustained growth of China's economy and consumption upgrading, the smart logistics market has huge potential and is expected to become a new growth point and competitive advantage for China's logistics industry. Wan Lisha [8], by analyzing the "2011-2022 China Smart Logistics Industry Market Size and Its Growth Rate," pointed out that the market demand for China's smart logistics industry shows a rapid growth trend, with a huge future market size. Feng Jia [9] and others, taking Jilin Province as an example, analyzed the current state of synergistic development of smart agriculture and smart logistics in Jilin Province and constructed a smart agriculture system for the coupled synergistic development of agriculture and smart logistics. As a new model for the development of modern logistics, smart logistics plays an increasingly evident role in supporting and guaranteeing regional green economic development. Liu Xiu [10], taking the Yangtze River Economic Belt as the research object, used a two-way fixed effects model, a mediating effect model, and a threshold effect model to empirically analyze that smart logistics is conducive to the development of the green economy. Fan Beibei [11] and Zhang Meiyan [12] analyzed the shortcomings of the "information silo" phenomenon and uneven digitalization level in the green agricultural product supply chain, proposing requirements for building a logistics information platform within the green supply chain. Furthermore, Ai Yongmei [13] and Hou Xiaojie [14] based on the context of rural revitalization, discussed the application of big data technology in green agriculture, pointing out the profound impact of smart logistics on the sustainable development of China's green agricultural product supply chain.

3. Current Status of Green Supply Chain Operation for Agricultural Products in Hubei under the Background of Smart Logistics

3.1. Operational Model of the Green Supply Chain for Agricultural Products in Hubei Province

"Hubei Province is an important major agricultural province in China, possessing abundant agricultural product resources [15]." However, due to long-term neglect of environmental protection and food safety issues in the agricultural production process, Hubei's agricultural product supply chain has some problems. To solve these problems, Hubei's agricultural department actively promotes the construction of a green supply chain and attempts to change the traditional operational models of the agricultural product supply chain.

The green supply operation model for agricultural products in Hubei Province includes stages such as agricultural product production, agricultural product processing, logistics distribution, and sales, namely the model dominated by large chain supermarkets, the model dominated by wholesale markets, the model dominated by farmer professional cooperatives, and the model dominated by production and processing enterprises [2].

3.2. Problems in the Operational Model of the Green Supply Chain for Agricultural Products in Hubei

3.2.1. Information Asymmetry and Lack of Transparency in the Production Stage

The problem of information asymmetry and lack of transparency in the production stage of Hubei's agricultural product supply chain mainly stems from the insufficient information technology application capability and lack of information sharing awareness among various entities in smart logistics technology. The lack of an intelligent information exchange platform in agricultural production leads to low levels of information exchange. During the agricultural production process, information exchange between agricultural enterprises and processing enterprises is neither balanced nor comprehensive. The vast majority of farmers and agricultural product processing enterprises do not benefit from smart logistics technologies such as big data support and electronic information technology during production, nor have they established reliable and relatively seamless information tracking systems, let alone created information records and publicly released information for the entire process from raw material procurement to processing and then to product sales. Therefore, upstream suppliers in Hubei's green agricultural product supply chain cannot timely and effectively understand market demand, while downstream enterprises and end consumers face certain obstacles in obtaining information about product origin and production processes. Downstream enterprises also find it difficult to promptly understand the production capacity and product varieties of farmers in different regions.

3.2.2. Energy Waste and Environmental Pollution in the Transportation and Storage Stage

Currently, the primary mode of transportation for agricultural products in Hubei is road transport, such as trucks, which is inefficient. Due to information asymmetry, trucks often run half-full or empty, resulting in extremely low energy efficiency. At the same time, long-distance transportation also generates a large amount of exhaust emissions, significantly impacting environmental pollution. Due to the lack of IoT technology application, a large number of transport vehicles, not equipped with intelligent monitoring and management devices like smart sensors, cannot monitor temperature and humidity control in real-time during transportation, thus affecting product quality. Furthermore, the hardware facilities of some warehouses are relatively outdated, suffering from low energy efficiency. Many warehouses still use traditional storage methods, unable to properly control conditions like temperature and humidity, which easily leads to spoilage and waste of agricultural products.

3.2.3. Poor Market Information Flow and Large Price Fluctuations in the Sales Stage

There are many market entities involved in agricultural sales in Hubei, but information exchange is insufficient. Some agricultural product wholesalers and retailers lack effective information platforms to timely understand the supply and demand situation of different regions and products, making it difficult for them to keep abreast of supply and demand relationships and price dynamics across different regions and products. This poses certain difficulties in their purchasing decisions. The price formation mechanism is not transparent enough, and the increasing demand and preference for green agricultural products can cause price fluctuations.

4. Countermeasures for the Development of the Green Supply Chain for Agricultural Products in Hubei Province

4.1. Construct Infrastructure and Sharing Platforms

First, Hubei Province needs to reduce energy consumption by introducing smart logistics technologies. On the other hand, investment in infrastructure such as logistics parks and warehouses must be increased to build a strong large-scale logistics network. These efforts will effectively narrow the urban-rural gap and ensure the effective transportation of agricultural products. Simultaneously, establish a comprehensive agricultural product monitoring system platform to achieve information exchange at all levels and actively promote the introduction of information technology. This will help improve the transparency and efficiency of the agricultural product supply chain, reduce various information asymmetry issues, thereby providing strong support for improving transportation efficiency, reducing transportation costs, and ensuring agricultural product quality.

4.2. Establish Standard Systems and Strengthen Supervision

Within the framework of national agricultural product standards, Hubei, as a major agricultural province facing quality and safety risks in its agricultural product supply chain, needs to take proactive measures to establish and improve a unified standardization system. This system should regulate all aspects of agricultural product production, management, processing, and transportation to improve product quality and effectively reduce risks. To this end, it is necessary to strengthen the supervision and management of the agricultural product production and circulation links, strictly control standards for agricultural product packaging, storage, and transportation, rigorously enforce pesticide residue standards, and intensify efforts to combat counterfeit and shoddy products and illegal business practices. This will effectively ensure agricultural product quality, protect consumer rights, maintain market order, and institutionally guarantee the greening and sustainable development of the agricultural product supply chain. Environmental measures such as green packaging and resource recycling can be adopted to build a more sustainable supply chain system and reduce environmental impact.

4.3. Cultivate Supply Chain Professionals

As logistics technology enters the era of smart logistics, addressing the various challenges of supply chain management requires a large number of talents with professional knowledge and skills in logistics and supply chain management. Therefore, Hubei Province must intensify efforts to cultivate talents in related fields, especially logistics and supply chain management professionals with an international perspective and advanced management ideas, particularly in agricultural product logistics. At the same time, technological investment must be increased to intelligently upgrade logistics technology, such as developing intelligent detection equipment and management systems to improve the operational efficiency and intelligence level of the supply chain. Form a "government + society" collaborative mechanism, establish a new agricultural socialized service system with enterprises as the main body. To achieve the sustainable development capacity of the agricultural product supply chain, greater efforts must be made in the research, development, and application of logistics technology. This includes using technologies such as the Internet of Things, big data, and artificial intelligence to enhance the intelligence and informatization level of the supply chain; improve the operational efficiency and service level of the supply chain to promote the application of smart logistics technology in the agricultural product supply chain; and ultimately achieve the sustainable development of the agricultural product supply chain.

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