

# Factors Influencing the Performance Evaluation of Agricultural Product Supply Chain in Guangxi Province, the People's Republic of China

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**Abstract:-** The research questions of this paper are: (1) What factors have an impact on the performance management of the agricultural product supply chain in Guangxi Province? (2) What are the problems in the supply chain management of agricultural products in Guangxi Province? (3) What is the model of the factors influencing the performance of evaluation of agricultural product supply chain in Guangxi province, The People's Republic of China?

Through the study of this paper, it is found that there are the following problems in the supply chain management of agricultural products in Guangxi Province: the quality of goods supplied by suppliers is uneven, the timeliness is slow, and the loss during transportation is large. The information systems of various agricultural enterprises are not fully popularized, data between different enterprises cannot be shared, the level of information management is not high enough, the efficiency of transportation management is low, and the quality of transported products cannot be guaranteed.

## ➤ Major Findings:

The research model takes the performance of the agricultural product supply chain in Guangxi Province as the dependent variable, the supplier performance evaluation (SPE) as the independent variable, and the information technology evaluation (ITE) and logistics performance evaluation (LPE) as the mediating variables. The validity of the survey plan and data was tested by confirmatory factor analysis and reliability analysis. Subsequently, the structural equation model and regression analysis were used to verify the various assumptions in the supply chain organization efficiency hypothesis model. This study deeply explores the many factors that affect the efficiency of the agricultural product supply chain. Finally, a new model for analyzing the factors affecting the performance of the agricultural product supply chain in Guangxi was constructed.

**Keywords:-** Performance Management; Agricultural Product Supply Chain Management; Guangxi Province.

## I. INTRODUCTION

In November 2021, the State Council of China issued a notice on the "14th Five Year Plan"(General Office of the Ministry of Finance General Office of the Ministry of Commerce [2022] No. 36) to promote the modernization of agriculture and rural areas, stating that the work related to agriculture, rural areas, and farmers is of utmost importance in comprehensively building a socialist modernized country. To implement the 14th Five Year Plan for National Economic and Social Development of the People's Republic of China and the Long Range Objectives for 2035, adhere to the priority development of agriculture and rural areas, comprehensively promote rural revitalization, and accelerate the modernization of agriculture and rural areas. During the 14th Five Year Plan period, the focus of China's "agriculture, rural areas, and farmers" work has shifted to comprehensively promoting rural revitalization and accelerating the modernization process of agriculture and rural areas with Chinese characteristics.

(1) As an important field of modern logistics development, agricultural product logistics plays an important role in improving the situation of agriculture, rural areas, and farmers and solving their problems. With the support of the country for the Beibu Gulf Economic Zone and the ASEAN Free Trade Area, Guangxi's agriculture is gradually "going global", providing a solid platform and broad prospects for agricultural product logistics in Guangxi. The development of agriculture and the entry of agricultural products into the market in Guangxi, as well as the seamless connection between supply and demand of agricultural products, require strong agricultural product logistics as support. Developing agricultural product logistics is an effective way to solve the problem.

(2) Various regions in Guangxi will include the development of agricultural facilities as a key task in the work of agriculture, rural areas, and farmers, as an important lever for rural industrial revitalization, and comprehensively increase investment in human, material, and financial resources. Cities and counties with outstanding achievements in agricultural facility development will receive priority support in project arrangements. The Implementation Plan for Accelerating the Development of Modern Agricultural Facilities in Guangxi (2023-2025) issued by the General Office of the Guangxi Autonomous Region Government (July 25, 2023) proposes to strengthen planning guidance, policy support, and factor guarantee, promote the intensive,

standardized, mechanized, green, and digital development of modern agricultural facilities in the entire region, and strive to achieve a total output value of agricultural facilities of over 300 billion yuan by 2025. By 2025, we will strive to create 1-2 autonomous region level demonstration parks with agricultural facilities as the main focus in each city, 5 national level demonstration parks with agricultural facilities as the main focus, and 3 national level coastal fishing port economic zones in the entire region, and scientifically plan the development layout of modern agricultural facilities. Strengthen the technological support of modern agricultural facilities, accelerate the breeding, introduction, testing, demonstration and promotion of suitable varieties for modern agricultural facilities, promote intensive breeding and breeding models such as high-rise building pig farming, poultry stacked high-efficiency cage farming, plant factories, and fish vegetable symbiotic three-dimensional factory farming according to local conditions, integrate and demonstrate modern breeding and breeding facility design, big data and artificial intelligence core algorithms, and reduce and preserve losses of vegetables, fruits, livestock, poultry, and aquatic products. Key technologies such as comprehensive utilization of waste.

Guangxi will focus on developing modern agricultural facilities in the fields of animal husbandry, fisheries, vegetables, fruits, silkworms, and edible fungi, and steadily promote the development of industrial facilities such as grain and oil, traditional Chinese medicine, and tea. We strive to comprehensively formulate the construction plan for modern agricultural facilities at the autonomous region, city, and county levels by 2025, further improve the standardization level of agricultural facilities in the entire region, achieve new breakthroughs in scientific and technological innovation, equipment upgrading, and mechanization rate of initial processing of agricultural products, and form an intelligent, intensive, efficient, and safe modern agricultural facility industry system.

Improve the level of modern agricultural facilities and equipment, establish an integrated mechanism for research, application, and promotion of agricultural facilities and equipment, and accelerate the development and promotion of agricultural facilities and equipment suitable for different industrial needs and regional characteristics. Promote the research and integration of technology in facility structure, specialized varieties, intelligent equipment, agricultural machinery and agronomy, and strengthen the promotion and application of efficient agricultural machinery, advanced intelligent equipment, and management systems.

Establish a sound modern agricultural facility management system, support leading agricultural industrialization enterprises to participate in major agricultural facility construction projects, develop deep processing of agricultural products, and lead the upgrading of modern agricultural facilities. By 2025, strive to add at least two autonomous region level or above agricultural industrialization leading enterprises with agricultural facilities as the main focus in each city.

In terms of logistics demand, Guangxi has a superior geographical location, mainly producing various vegetables, South Asian tropical fruits, and aquatic products, and the logistics demand is constantly increasing; In terms of logistics mode, the logistics of agricultural products in Guangxi is still in its early stages. Due to differences in economic development level, geographical location, and climate conditions, a wholesale market dominated logistics model dominated by cooperatives or processing enterprises has emerged, occupying a dominant position in agricultural product logistics. At present, the main problems in the logistics of agricultural products in Guangxi are high circulation costs, large losses, low value-added capacity, and due to the asymmetry of demand information, some areas of Guangxi have serious and irregular unsold agricultural products. The lack of supply chain construction for agricultural products has become a bottleneck for the development of modern agriculture in Guangxi.

The concept of agricultural product supply chain: Agricultural product supply chain is a series of processes that coordinate the interests of agricultural production materials suppliers, producers, distributors, and consumers by controlling the logistics, information flow, and capital flow of agricultural products. Starting from agricultural production materials, it completes the planting, acquisition, processing, transportation, and distribution of agricultural products, including agricultural product production, acquisition, transportation, storage, loading and unloading, circulation, processing, packaging, etc. A series of processes such as delivery and sales (Xue Li Ke 2014).

The concept of supply chain performance evaluation refers to the pre -, during -, and post analysis and evaluation of the overall and operational status of the supply chain, as well as the operational relationships between each link, based on the business processes of the supply chain, around the goals of the supply chain..

#### A. *Research Objective*

- To study the problems in the supply chain management of agricultural products in Guangxi Province.
  - To analyze the influencing factors on the performance management of the agricultural product supply chain in Guangxi Province.
- To develop a new model of factors influencing the performance of evaluation agricultural product supply chain in Guangxi province, The People's Republic of China.

#### B. *Research Hypothesis*

- Hypothesis 1: Supplier performance evaluation has direct influence on information technology evaluation.
- Hypothesis 2: Supplier performance evaluation has direct influence on performance evaluation of agricultural product supply chain.
- Hypothesis 3: Supplier performance evaluation has direct influence on logistic performance evaluation.

- Hypothesis 4: Information technology evaluation has direct influence on performance evaluation of agricultural product supply chain.
- Hypothesis 5: logistic performance evaluation has direct influence on performance evaluation of agricultural product supply chain.

- Hypothesis 6: Supplier performance evaluation has indirect influence on performance evaluation of agricultural product supply chain through information technology evaluation.
- Hypothesis 7: Supplier performance evaluation has indirect influence on performance evaluation of agricultural product supply chain through logistic performance evaluation.

C. Research Framework

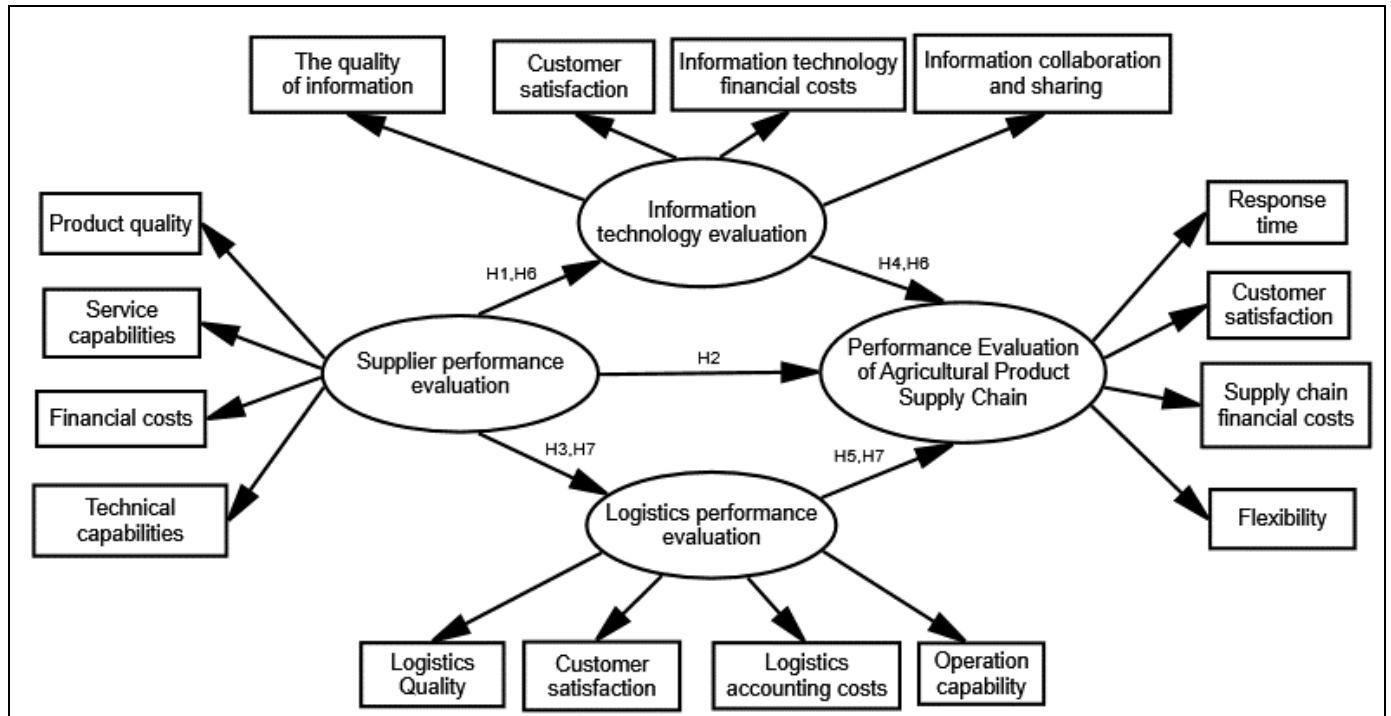


Fig 1: Research Framework

II. LITERATURE REVIEW

Chen Keyu and Xie Qiuju (2009) believe that the performance of various entities in the agricultural product supply chain directly affects the efficiency of the agricultural product supply chain. The suppliers of agricultural products may be scattered small farmers, large-scale farms, agricultural cooperative economic organizations, or agricultural production companies. These entities are at the top of the supply chain and are closely related to the quality and safety of agricultural products, agricultural logistics, etc. Their performance directly affects the efficiency of the entire supply chain. When selecting suppliers, core enterprises will also measure the specific situation of suppliers and establish a supplier evaluation system: product quality, product price, service level, and delivery capacity to evaluate the performance of suppliers and select suitable suppliers, thereby improving the efficiency of the enterprise and the overall supply chain.

Fang Lina and Guo Jing (2015) found through literature review that research on supplier quality management mainly focuses on two levels: supplier selection and evaluation, and the impact of supplier behavior on supply chain quality management and performance. The agricultural product supply chain has the

following characteristics: overall, the knowledge and cultural qualities possessed by participants in the agricultural product supply chain are relatively low; The supply-demand relationship of agricultural products requires high demands, and the characteristics of the supply-demand relationship of agricultural products are: production is seasonal and regional, consumption is annual and national; The circulation of agricultural products requires modern logistics technology support. They divided supplier behavior into three dimensions: opportunistic behavior, sharing behavior, and cooperative behavior to analyze the impact of supplier behavior on the performance of agricultural supply chains. Through questionnaire design and survey to search for data, empirical research is conducted using structural equation modeling to investigate the impact of supplier behavior on the performance of agricultural product supply chains. Based on empirical research, relevant management insights are provided to enterprises in the agricultural product supply chain.

Based on empirical results, the following conclusions and inspirations are drawn: firstly, opportunistic behavior of suppliers has a significant negative impact on financial performance and production service performance. The empirical results indicate that opportunistic behavior of suppliers can reduce the financial performance and

production service performance of enterprises. Secondly, the sharing behavior between suppliers and producers has a significant positive impact on production service performance. The empirical results indicate that the sharing behavior between suppliers and producers can improve the production service performance between supply chain enterprises. Thirdly, cooperative behavior has a significant positive impact on financial performance, production service performance, and supplier operational performance. The empirical results show that the cooperative behavior of suppliers can improve the financial performance, production service performance, and supplier operational performance among supply chain enterprises.

Botswana (2009), in their study of manufacturing firm found that increased number of suppliers, parts, products, and customers do not affect manufacturing performance and propose that information technology may be the reason. Our study provides empirical evidence for their subject

Bozarth et al. (2009) found in their study of manufacturing enterprises that an increase in the number of suppliers, parts, products, and customers does not affect manufacturing performance, and suggested that information technology may be the reason.

Wu Yan elaborated on the impact of information sharing on supply chain performance, and based on the classification of shared information, analyzed the main obstacles that restrict information sharing. He proposed methods and measures to achieve supply chain information sharing, thereby ensuring effective management of the supply chain system. Wang et al. (2013) pointed out that early research on the role of IT mainly focused on exploring the direct impact of IT capabilities on various performance or advantages, while ignoring the role of important mediating factors, leading to a long-standing debate in the academic community about the "IT productivity paradox". Recent research suggests that IT may play a role through mediating factors. Chen et al. studied the impact of IT capability and business process agility on organizational performance; Yu Cheng'en (2009) believes that information capability has a significant impact on the supply chain performance of the first type of industry, as IT system support capability, information system integration capability, and internal information sharing capability all have a significant impact on supply chain performance; The impact of information capability on the supply chain performance of the second type of industry is not significant, only the impact of information system integration capability on performance is significant. Zhou Sihua (2016) summarized two main types of electronic information integration in the supply chain: inward information integration and outward information integration, and explored the multidimensional composition of IT capabilities and their impact on supply chain integration and supply chain performance.

Song Wenfei (2018) analyzed the impact and implementation effect of ERP system on the optimization performance of agricultural product supply chain by comparing the inventory turnover rate, accounts receivable turnover rate, total asset turnover rate, net profit rate, and main business income growth rate of enterprises before and after the implementation of ERP.

In the process of supply chain collaboration and performance improvement, previous research has shown that information sharing has significant value. Research on how to guide and implement information sharing is mostly conducted through logical reasoning, and empirical research is still scarce. Therefore, further combining different operational characteristics of supply chain management and various specific scenarios, through empirical research, exploring the impact analysis and value research of information sharing on supply chain collaboration and performance will be a hot topic and main direction of future research. This has important research significance for deepening the practice of supply chain management in the context of informatization.

Fang Yongyan (2006) focused on the subdivision functions and goals of logistics management under supply chain management, as well as the new changes in logistics in the e-commerce environment. The logistics distribution model is mainly composed of manufacturers, distributors and retailers, and transportation service providers.

Zhang Jing and Fu Xinhong said that the management of agricultural product logistics distribution supply chain is an integrated process of planning, organizing, coordinating, and controlling the information flow, material flow, and capital flow on the functional network chain structure formed by the core organization of agricultural product logistics distribution and its upstream and downstream related organizational carriers. Implementing supply chain management for agricultural product logistics distribution can improve the efficiency of agricultural product logistics distribution and promote the development of the agricultural product logistics distribution industry.

Cao Bingru and Fan Yanqing combined principal component analysis with DEA, selecting four indicators: economy, innovation, supply chain operation, and environment to establish an evaluation model. The empirical results showed that input of production factors, brand, resource utilization efficiency, and technological innovation were the main factors causing regional differences in the performance level of agricultural product supply chains.

Wang Kaixuan and Yang Yuzhong used grey clustering and fuzzy comprehensive evaluation methods to study the performance evaluation model of agricultural product supply chain. The results showed that transportation and distribution efficiency and scientific research innovation ability greatly affect the performance level of agricultural product supply chain.

Yan Jialing (2014), Jiang Changyun, and Hong Qunlian (2013) pointed out that there are many defects and deficiencies in the domestic agricultural product supply chain, such as involving multiple processes, low efficiency, low overall development level, and excessive resource waste. Optimizing the agricultural product supply chain has become a practical issue. Du Yudi (2018) believes that the supply chain of China's agricultural product foreign trade industry is facing great challenges, and the entire supply chain needs to be reconfigured, integrated, and optimized in order to achieve maximum benefits. Zhang Deyin, Wang Lingling (2017): A key issue that modern fresh agricultural product enterprises attach importance to is that the industry chain faces many changes and uncertainties due to factors such as talent transfer, information transmission, economic cycle, procurement, policy legislation, etc., which increases the difficulty of risk control. From the perspective of supply chain structure, Jia Qiangfa (2017) found that China's fresh agricultural product supply chain has problems such as incomplete supply chain system, low efficiency, quality and safety. It is urgent to build a flat fresh agricultural product supply chain from the source, supply chain nodes, and supply terminals, based on the principle of benefiting consumers, society, and the supply chain. Lin Jie and Dai Xiying (2018) take the supply chain of agricultural product processing enterprises in Jilin Province as an example, and believe that there are prominent problems such as dispersed and diversified supplier entities, weak core processing enterprise strength, relatively lagging logistics development, weak technology in agricultural product processing, and information asymmetry. They also propose to leverage the radiation driving function of core enterprises, adopt various advanced management methods to improve the operational efficiency of each node. Promote the establishment of a direct sales and supply system for agricultural product processing enterprises, and establish optimization plans such as a supply chain management information system. Fu Meifeng (2011) has continuously improved and integrated the management of the agricultural product supply chain, taking the large-scale chain supermarkets on this chain as the core enterprises. In the process of improving the agricultural product supply chain, achieving the integration of agriculture and supermarkets is an important measure, and seeking strategies and solutions to supply the best products to the market. From the perspective of the value chain, Wang Dongbo (2017) believes that the integration and optimization of agricultural product supply chains can be carried out through multiple levels of collaboration, including depth (strengthening link agglomeration) and breadth (strengthening information sharing). From the practice of fruit and vegetable supply chain, there are still many structural difficulties, such as low degree of organization of production and operation entities, insufficient wholesale market services and functions, incomplete logistics information system, lack of establishment of cold chain logistics system, and low quality and safety of fruits and vegetables. Jiang Qian (2016) further developed agricultural e-commerce, optimized the management, business, and financial systems of agricultural e-commerce, and constructed a strategic

alliance for the supply chain of agricultural product processing enterprises, in order to effectively promote the reconstruction and optimization of China's agricultural product supply chain system.

### III. RESEARCH METHODOLOGY

The aim of this research is to study the problems in the supply chain management of agricultural products in Guangxi Province. To analyze the influencing factors on the performance management of the agricultural product supply chain in Guangxi Province. And to develop a new model of factors influencing the performance of evaluation agricultural product supply chain in Guangxi province, The People's Republic of China. This research is a quantitative and qualitative research. The survey used a questionnaire design. and interviews were conducted.

#### A. Population

The survey subjects of this study are management personnel of agricultural product enterprises in Guangxi, and the survey locations mainly include: Nanning City, Liuzhou City, Yulin City, Guilin City, Guigang City and other regions.

#### B. Sample Size

- **Quantitative Research** The respondents of this study are managers of agricultural product enterprises in Guangxi, and the survey sites mainly include Nanning, Liuzhou, Yulin, Guilin, Guigang and other regions. As of 2022, there are currently 23 and 795 large-scale agricultural operating entities in Guangxi. These large-scale agricultural operators are mainly concentrated in Nanning, Liuzhou, Guilin, Yulin, Guigang and other places in Guangxi. Therefore, these regions were selected as the sample collection areas for the questionnaire. (Source: Department of Agriculture and Rural Affairs of Guangxi Zhuang Autonomous Region, 2023)
- **Qualitative Research** Using the in-depth interview method, a total of 15 managers including 2 people from Guangxi Province's transportation industry, 3 person from a agricultural business entities, 3 people from supermarkets, 3 people from shopping malls, 2 people from cold chain transportation companies, and 2 people from government departments were selected for qualitative research.

#### C. Research Tools

The research content of this article mainly focuses on the factors influencing the development of effective evaluation system of agricultural product supply chain in Guangxi Province. The research method is a sampling survey, and respondents are randomly selected to participate in the survey. The questionnaire is mainly divided into five parts.

Part 1: The questionnaire provides general information about the respondent's organisation. The questionnaire consists of 5 questions including gender, age, education level, position and working hours in the

agricultural industry. These factors influence the respondent's understanding of the agricultural supply chain in Guangxi.

Opinion ratings from parts 2 to 5 are all in the form of a five-point Likert scale divided into five levels: (5) strongly agree, (4) agree, (3) neutral, (2) disagree, (1) strongly disagree. Parts 2 to 5 are based on the questionnaire questions shown in 3.1 model analysis.

An average score of	4.20-5.00 or strong agreement
On average,	3.40-4.19 indicated agree
Average	2.60-3.39 neutral
Average	1.80-2.59 indicates disagree
An average score of	1.00-1.79 strongly disagree.

#### D. The Statistics used in Data Analysis

Descriptive statistical analysis Method of descriptive statistical analysis following data collection. An activity that uses tables, graphs and calculations of summarised data to describe data characteristics. Measures include percentage, mean and standard deviation. There are 23 observable variables and, using Statistical Products and Services Solutions software, the measurements include mean, standard deviation, kurtosis and skewness. The Z-test statistic is used to test whether the assumptions of skewness and kurtosis are different from zero. If the observed variable has a left-skewed distribution, SK has negative strength ( $SK < 0$ ), and if the variable has a normal distribution,  $SK = 0$ , the variable has a normal distribution curve. If the observed variable has a right-skewed distribution, SK has a positive strength ( $SK > 0$ ) and the value of the normal distribution curve  $KU = 3$ , indicating that the peak of the normal distribution curve or frequency distribution curve has a medium strength. If KU is less than 3, the frequency distribution curve is short and flat, and if KU is greater than 3, the distribution curve is higher (Sirichhai Kanchanawasi, 2002).

Statistical analysis of the relationship between variables. The Pearson product-moment correlation coefficient (PPMCC or PCCs) analysis is used to analyze the relationship between variables, so as to understand whether there is a linear relationship between variables, the direction and size of the relationship, and use it as an analysis of Agricultural product supply chain performance in Guangxi Province. The basis of factors influencing Agricultural product supply chain performance. If PPMCC is close to -1 or 1, it indicates that the degree of correlation is very high. If it is close to 0, it indicates that the degree of correlation is 0 or not.

## IV. RESULTS

This paper focuses on the factors influencing the efficiency of the agricultural product supply chain in Guangxi Province and their interrelationships. Based on an extensive review of literature, this study constructs and attempts to validate a hypothetical model of agricultural product supply chain efficiency. The agricultural product supply chain industry in Guangxi Province is selected as the empirical context. Following the hypothesis model and drawing from the research findings of both domestic and international scholars, a set of survey schemes and questionnaires tailored to this study are

designed. A comprehensive survey is conducted across wholesale markets, processing enterprises, logistics companies, consumer enterprises, and production bases within the agricultural product supply chain in Guangxi Province to collect first-hand data.

Through the research in this article, it was found that there are the following problems in the supply chain management of agricultural products in Guangxi Province: the quality of goods supplied by suppliers is uneven, the delivery time is slow, and the loss during transportation is large; the information systems of various agricultural enterprises are not fully popularized, and data between different enterprises cannot be shared. The level of information management is not high enough, the efficiency of transportation management is low, and the quality of transported products cannot be guaranteed. In the research model, the performance of the agricultural product supply chain in Guangxi Province is the dependent variable, while supplier performance evaluation (SPE) serves as the independent variable. Information technology evaluation (ITE) and logistic performance evaluation (LPE) are included as mediating variables. The validity of the survey scheme and data is tested through confirmatory factor analysis and reliability analysis. Subsequently, structural equation modeling and regression analysis are used to verify the various assumptions in the supply chain organizational efficiency hypothesis model.

The study thoroughly discusses the numerous factors affecting the efficiency of the agricultural product supply chain. Finally, based on the current state of the agricultural product industry in Guangxi Province, this paper analyzes how these factors impact supply chain performance through interviews with professional managers and related workers. The analysis also identifies issues in the performance management of the agricultural product supply chain in Guangxi Province and proposes ideas for future development and optimization of the supply chain. For example, due to the perishable nature of agricultural products, it is necessary to regulate the temperature and duration of the logistics process within the agricultural product supply chain. The temperature coordination of enterprises at each node can better ensure the quality of agricultural products; time coordination can effectively shorten logistics time, reduce agricultural product losses, and improve the overall efficiency of logistics; the coordination of cold storage facilities, warehouses and transportation facilities can reduce the production and transportation costs of enterprises. The inherent characteristics of agricultural products, namely, they are greatly affected by seasonal factors and are perishable, are considered to be the most variable factors in supply chain management. These characteristics are also the primary factors affecting the flexibility of supply chain cooperation. Therefore, trust and commitment between partners are the key to achieving flexible supply chain management. The coordination of various links in the supply chain is crucial. Improving the coordination capability of the supply chain requires improving the degree of informatization and the ability to predict future uncertain demands. For the agricultural product supply chain, due to the natural attributes of agricultural products, coordination is particularly important for improving operational efficiency. Information technology provides the necessary data support for the coordination between supply chain members, thereby

promoting better coordination. However, due to the time delay of information dissemination and the low probability of effective information sharing, the information integration of upstream and downstream logistics operations is limited. This hinders enterprises from achieving economies of scale and improving overall competitiveness. Specifically, it is crucial to integrate the production, supply and marketing of raw materials, semi-finished products and finished products, and to centrally allocate resources to increase corporate profits.

A hypothesis model of the organizational efficiency of the agricultural product supply chain is constructed. Utilizing organizational theory, vertical cooperation theory, supply chain management theory, and an extensive literature review, the study identifies the various factors affecting the efficiency of the agricultural product supply chain and explores the potential relationships among these factors. Agricultural products differ from ordinary commodities due to their susceptibility to seasonal and regional influences, periodicity, and perishability, making them a unique element in the supply chain. The agricultural product supply chain is a multi-dimensional network structure with numerous participants. Evaluating its performance requires a comprehensive consideration of the interests of all participants, the conditions of each link in the supply chain, and the overall operation of the supply chain.

As a pillar industry of the national economy, agricultural products represent a comprehensive sector involving numerous entities and closely related to many other industries. The production and processing of agricultural products necessitate the collaboration of multiple food companies and departments. Therefore, the hypothetical model incorporates supplier-related factors, information management-related factors, and supply chain collaborative performance factors to explore their impact on the performance of the agricultural product supply chain in Guangxi Province.

This study distributed questionnaires to 400 industrial personnel in Guangxi Province and recovered 400 valid questionnaires. According to the research results, it was proved that supplier performance evaluation (SPE) has a significant positive impact on information technology evaluation (ITE), logistic performance evaluation (LPE) and performance evaluation of agricultural product supply chain (PE). At the same time, the information technology evaluation and logistic performance evaluation have a significant positive impact on the performance evaluation of agricultural product supply chain. The results answered the second research goal, that is to study the relationships between influence factors and performance evaluation of agricultural product supply chain. Supplier performance evaluation has a positive impact on logistics service system evaluation, with a path coefficient of 0.898, and this research further explore the influence extent’s indirect parts and direct part. The direct impact of supplier performance evaluation on performance evaluation of agricultural product supply chain is 0.354. Supplier performance evaluation has a positive impact on the information technology evaluation, with a path coefficient of 0.950. Supplier performance evaluation has a positive impact on logistic performance evaluation with the extent level of 0.883. Information technology evaluation has a positive impact on performance evaluation of agricultural product supply chain in the path level of 0.152 at the significant level of 0.05 and logistic performance evaluation has a positive impact on performance evaluation of agricultural product supply chain with the path coefficient of 0.454 at the significance level of 0.01. Based on these path coefficients, the direct impacts from these two mediation variables can be divided to: information technology performance occupies 16.03%, of the total impact and logistic performance evaluation occupies 44.55% of the total impact.

Table 1: Summary of Research Hypothesis Testing Results

Research Hypothesis	Test Result
Hypothesis 1 (H1) Supplier performance evaluation has direct influence on information technology performance.	Accept
Hypothesis 2 (H2) Supplier performance evaluation has direct influence on performance evaluation of agricultural product supply chain.	Accept
Hypothesis 3 (H3) Supplier performance evaluation has direct influence on logistic performance evaluation.	Accept
Hypothesis 4 (H4) Information technology evaluation has direct influence on performance evaluation of agricultural product supply chain.	Accept
Hypothesis 5 (H5) logistic performance evaluation has direct influence on performance evaluation of agricultural product supply chain.	Accept
Hypothesis 6 (H6) Supplier performance evaluation has indirect influence on performance evaluation of agricultural product supply chain through information technology evaluation.	Accept
Hypothesis 7 (H7) Supplier performance evaluation has indirect influence on performance evaluation of agricultural product supply chain through logistic performance evaluation.	Accept

**V. DISCUSSION**

This paper focuses on the impact of suppliers, information systems, and network connections on the overall efficiency of the agricultural product supply chain. From Supply management theory, there is a supply chain management method of product manufacturing, transfer, distribution and sales that effectively organizes suppliers, manufacturers, warehouses, distribution centers and

channel providers in order to minimize the cost of the entire supply chain system under the condition of satisfying a certain level of customer service. Choi et al. (1996) involved the evaluation and selection of suppliers in the supply chain when studying supplier behavior, so supplier management plays in important role for the whole agricultural product supply chain performance management. For an agri-food business, it is important to choose a supplier of goods and services. Agribusiness and

suppliers establish a set of pricing, distribution and payment processes and create ways to monitor and improve management, and integrate the management of goods and services provided by suppliers, including picking up goods, verifying bills of lading, forwarding goods to your manufacturing department and approving payments to suppliers (Lee, 1993).

Lin et al. (1998) highlighted that the supply chain is a complex network structure involving logistics, information, and capital, encompassing supply, manufacturing, and sales. Li and Bai (2012) defined the supply chain from a functional perspective, emphasizing the transformation from raw materials to semi-finished and finished products. Srivastava (2007) studied the composition of the supply chain and asserted that raw material suppliers, manufacturers, warehousing, transportation, sales, and consumers constitute a complete supply chain. Gavriel and Michal (2024) noted that the supply chain extends beyond internal logistics to include processes from raw material supply to processing, packaging, and distribution, with each node enterprise forming a value chain from processing to sales. Sumrit and Pingsusaen (2024) analyzed the supply chain from a raw material value-added perspective, asserting that the process from raw materials to processed finished products and finally to customers realizes the value-added of goods. Hossein et al. (2023) described the supply chain as a fully functional network structure formed during the coordination and control of workflow, logistics, capital flow, and information flow, starting from raw material procurement to the delivery of products to consumers. It comprises suppliers, manufacturers, distributors, retailers, and final consumers. Hence, it is reasonable to consider the influencing factors from these three aspects.

Applying supply chain management theories to the agricultural product industry, traditional supply chain theory examines logistics, business flow, and information flow. Aydin (2022) found that in third-world countries, the agricultural output of private enterprises is positively correlated with the agricultural production services they provide, enhancing agricultural development. Smith (2012) proposed decentralized reforms in agricultural production services to promote overall social and economic progress. Wen et al. (2014) suggested that cooperation between government and enterprises can reduce the cost of agricultural product services, thereby improving service efficiency. These studies highlight the emerging role of supplier service levels in agriculture. As agricultural market-oriented reforms deepen, the impact of service levels on agricultural product supply chain performance will increase, aligning with this paper's conclusions.

Regarding information technology, qualitative and quantitative analyses reveal its significant role in enhancing performance. Moreover, information technology evaluation is helpful for the supply chain evaluation based on supply management theory. Supply chain members such as manufacturers, wholesalers and retailers are connected through efficient information systems. All parties

coordinate and cooperate with each other to meet the needs of consumers better, faster and at a lower cost of supply chain management solutions (Zhang, 2013). Effective customer response is based on the principle of meeting customer requirements and minimizing logistics process costs, and can make timely and accurate responses to optimize the supply of goods or service processes. Then, From the perspective of supply logistics, in supply chain management, inventory management is to coordinate among supply chain members to minimize inventory investment and cost; The traditional logistics management is to push the inventory forward or back, depending on who has the most initiative in the supply chain. In fact, traditional logistics management merely shifts inventory by pushing inventory to suppliers and reducing inventory investment in the channel. The solution to this problem is to provide information about production planning, such as sharing information about expected demand, orders, production plans, etc., to reduce uncertainty and reduce safety inventories.

However, respondents noted that the current informatization level of agricultural product supply chains in Guangxi Province is limited and needs to leverage policy advantages further. The 19th National Congress of the Communist Party of China advocated for the deep integration of the Internet, big data, artificial intelligence, and the real economy to build a digital China and a smart society (Kamalkhani & Sana, 2022). With the advancement of the rural revitalization strategy, the development of China's agricultural digital economy and intelligent management of agricultural product supply chains is both an inevitable trend and requirement. Presently, there is a lack of targeted, in-depth research on the digital development of agricultural product supply chains and their performance management theories, evaluation methods, and factor indicators. The design of related performance evaluation models and their indicator systems still follows traditional supply chain performance management models. The level of agricultural digital development varies across regions in China, and the management models differ. The research and development of digital supply chain performance management and evaluation are still immature, lacking a unified and standardized digital performance management system, norms, and standards (Wen et al., 2014). Furthermore, the digital management transformation and development of agricultural product supply chain organizations are in their early stages, and the leading capabilities and levels of core supply chain enterprises are limited, resulting in insufficient attention to digital agricultural product supply chain performance management (Bayode et al., 2020). Additionally, due to the diversity of business models and the complexity of the digital agricultural product supply chain's basic element system, its performance connotation, characteristics, and management model are not specific and comprehensive, necessitating continuous in-depth theoretical and practical discussions.



From the perspective of logistics performance evaluation, the collaborative operation level of each node enterprise in the agricultural product supply chain involves treating the enterprises at each node as a unified whole. To maximize their benefits, each enterprise collaborates in information flow, logistics, and capital flow, enabling rapid market response. Supply chain collaboration enhances connections between agricultural product supply chain enterprises, improving consumer satisfaction and reducing corporate costs. Gilmour (1998) and others proposed the logistics integration theory, expanding the concepts of procurement and supply chain management to internal operations, suggesting that enterprises achieve efficiency improvements and stronger business partnerships through logistics business process integration. Innis (2005) analyzed logistics integration strategies to enhance service capabilities and value from a logistics strategic planning perspective. Giannoccaro (2008) emphasized that logistics system planning and implementation are crucial for enterprise operations. Logistics integration, divided into internal and external integration, must be effectively combined to comprehensively improve the overall performance of the agricultural product supply chain.

## VI. SUGGESTIONS FOR FURTHER RESEARCH

### A. Suggestions

This paper presents an empirical study on the factors affecting the performance of evaluation agricultural product supply chain enterprises in Guangxi Province. However, this study has certain limitations:

#### ➤ *Limitations of the Questionnaire*

Although this paper utilizes a well-established scale, the results may vary for different research subjects. The questionnaires were primarily collected online, necessitating a broader source to enhance reliability. Additionally, the survey subjects in this study were predominantly from government departments and enterprise management sectors, lacking representation from academic theoretical research.

#### ➤ *Limitations of the Sample*

The quantity and quality of the sample significantly impact the study's results. This paper analyzed 400 valid questionnaires, which meets the basic requirements. However, the model's credibility could be enhanced by diversifying the questionnaire distribution channels and increasing the sample size. More frequent field visits are necessary to gather more detailed data.

#### ➤ *Limitations of the Structural Equation Model*

The author reviewed domestic and international literature to design a structural equation model of the factors affecting the performance of the agricultural product supply chain. While the model incorporates various dimensions such as material flow, information flow, capital flow, and service level, it does not encompass all potential factors, resulting in certain limitations.

### B. Suggestions for Next Research

To improve future research and provide a more detailed basis for corporate decision-making, the following enhancements are recommended:

#### ➤ *Increase the Observation Scale*

Provide more detailed data support for the research by increasing the scope and depth of observations.

#### ➤ *Broaden the Sample Source*

Eliminate errors caused by data limitations by diversifying the sources of samples.

#### ➤ *Refine Research Dimensions*

Further clarify the impact of each variable on the performance of the agricultural product supply chain by refining the research dimensions.

It is hoped that this research can provide a valuable basis for the development and decision-making of more agricultural product supply chain companies.

### C. New Knowledge

This paper takes agricultural product production enterprises in Guangxi Province as the research object, explores the relationship between supplier performance evaluation, information technology evaluation and logistics performance evaluation and performance evaluation of agricultural product supply chain, and proposes seven research hypotheses. and concludes that supplier performance evaluation, information technology evaluation and logistics performance evaluation have direct and indirect effects on performance evaluation of agricultural product supply chain. The indirect effect clarifies their mechanism of action, supplements and enriches previous research. Specifically, the new understandings obtained in this paper are:

(1) This paper emphasizes the importance of supplier performance evaluation, and believes that it is a key factor affecting performance evaluation of agricultural product supply chain and the main driving force for improving performance evaluation of agricultural product supply chain. Based on previous literature, this paper proposes four dimensions of supplier performance evaluation: Product quality, Service capabilities, Financial, and Technical capabilities. The results of this study show that the four dimensions of supplier performance evaluation have a positive direct impact on performance evaluation of agricultural product supply chain, and also indirectly affect performance evaluation of agricultural product supply chain through Information technology evaluation and Logistics performance evaluation.

(2) This paper emphasizes that Information technology evaluation and Logistics performance evaluation are important mediating variables affecting performance evaluation of agricultural product supply chain, and are also important dependent variables of supplier performance evaluation. Based on previous literature, this paper proposes four dimensions of Information technology evaluation, including: The quality of information, Customer satisfaction, Information technology

financial costs, Information collaboration and sharing; based on previous literature, this paper proposes four dimensions of Logistics performance evaluation, including: Logistics quality, Customer satisfaction, Logistics accounting costs, Operation capability. The results of this paper show that the four dimensions of Information technology evaluation and the four dimensions of Logistics performance evaluation have a positive direct impact on performance evaluation of agricultural product supply chain.

(3) This paper emphasizes the connotation of performance evaluation of agricultural product supply chain and believes that performance evaluation of agricultural product

supply chain is actually multidimensional. Different analysis perspectives lead to different conclusions. Based on previous research results, four dimensions of performance evaluation of agricultural product supply chain are proposed, including: Response time, Customer satisfaction, Supply chain financial costs, and Flexibility. This study shows that these four performances are directly and indirectly affected by dimensions such as supplier performance evaluation, Information technology evaluation, and Logistics performance evaluation, and reflect the competitive advantage and sustainability of performance evaluation of agricultural product supply chain in Guangxi Province.

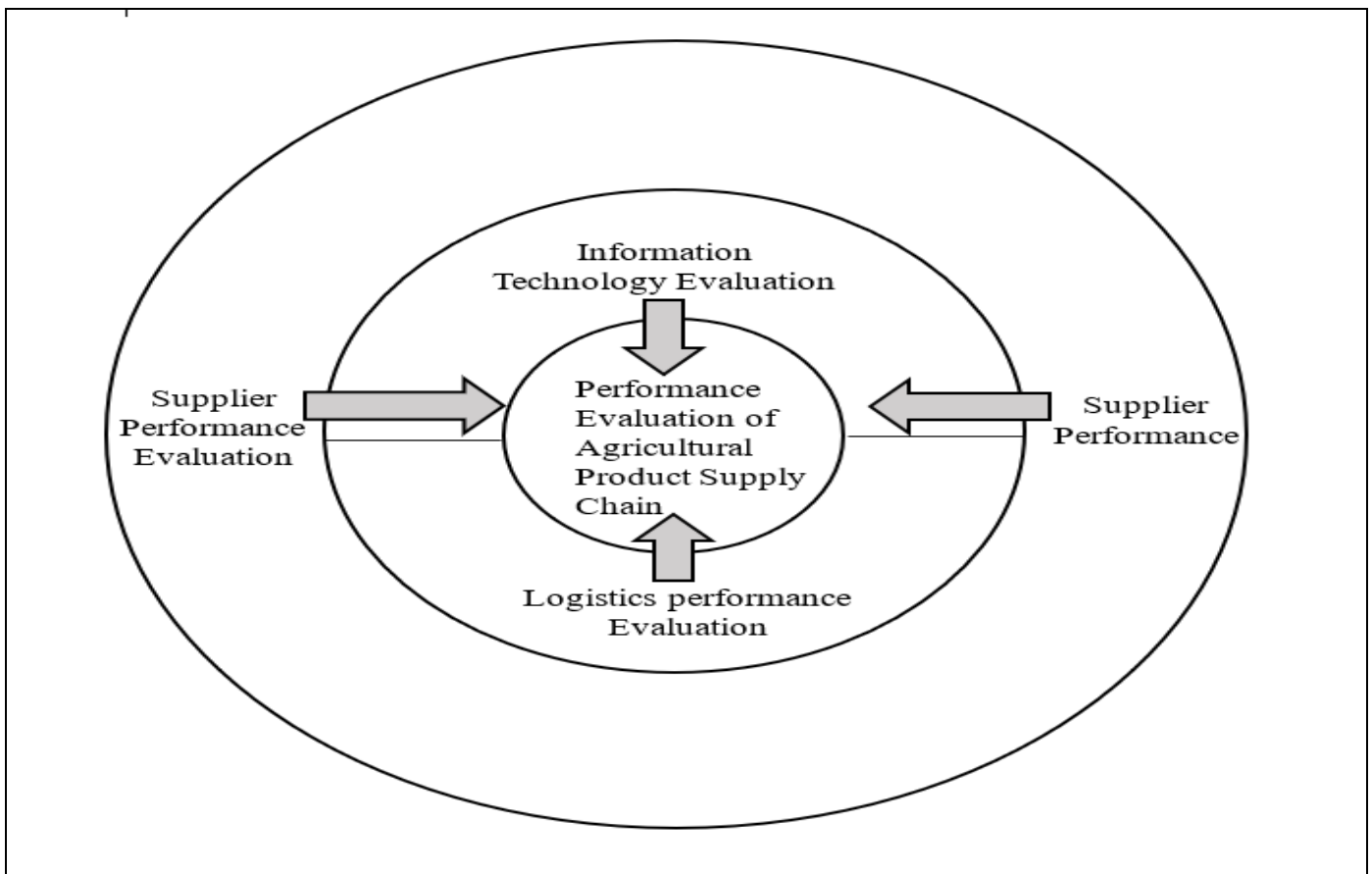


Fig 2: Research New Knowledge

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