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The Performance Evaluation of Vegetable Supply Chain under the Docking Mode of Agricultural Supermarket

Yanhong Wu[1, 2*]

[1]*Zhanjiang Science and Technology College, Zhanjiang, China*

[2]*Ucsiuniversity, Kuala Lumpur, Malaysia*

margi1983@zjkju.edu.cn

[*]*corresponding author*

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Abstract: With the rapid economic development, environmental pollution is becoming increasingly serious, and sustainable development has become a research hotspot. The agricultural super-docking mode vegetable supply chain reduces the many circulation links of the traditional supply chain, reduces the circulation cost, improves the circulation efficiency, and contributes to sustainable development. As a new type of agricultural product circulation mode, agricultural super-docking has played an active role in reducing the intermediate circulation of agricultural products, reducing the circulation cost, increasing farmers' income, promoting the coordinated development of urban and rural areas, and promoting agricultural modernization. On this basis, In this paper, the research on the performance evaluation of vegetable supply chain under the docking mode of agricultural super is carried out. This paper uses the analytic hierarchy process to select and build a more scientific performance evaluation index system, design performance questionnaires, select agricultural super-docking supermarkets, rural cooperatives, and vegetable planting bases to conduct field surveys and issue questionnaires. Use fuzzy comprehensive evaluation method to evaluate the overall performance of the vegetable supply chain under agricultural docking, and compare and evaluate the performance of different types of agricultural supply chain. The results of this study show that The score is 68.279, which indicates that the respondent's performance evaluation on the vegetable supply chain of the agricultural supermarket is medium. Among them, the performance scores on the quality safety and customer dimensions are high, while the performance on the financial, operating process and information management dimensions need to be improved.

1. Introduction

Solving the problem of supply and consumption of agricultural products is one of the important branches to solve the problems of agriculture, rural areas, and farmers.In 2019, the Central Document No. 1 clearly stated that “consolidate the foundation of agriculture and ensure the effective supply of important agricultural products”, and protect farmers in the continuous optimization and improvement of the agricultural product supply chain. To improve their income level, and overcome poverty. In addition, it is also proposed in the "19th National Congress" rural revitalization strategy to build a modern agricultural industrial system, production system, and management system, and develop various forms of moderate-scale operations to achieve small-scale farmers and The organic connection of modern agricultural development, the "agricultural super-docking" is just from the perspective of the supply chain management of agricultural products, connecting the agricultural product circulation model of farmers, professional cooperatives of farmers, supermarket chains and other parties. As a more efficient way of circulation, agricultural super-docking is available. It has been widely used abroad with a market share of 70% to 80%. However, the supply chain transportation model in China is still based on the wholesale market. Under this sales model, farmers are far away from the market and away from consumers. The latest market information. Agricultural production is blind. For farmers, it is easy to produce unnecessary losses. For consumers, too many circulation links will cause the price of products to rise. The agricultural super-docking mode is used to purchase products directly from the agricultural place. Leaping through the middlemen and connecting the products to the sales terminal or consumers directly reduces the loss of agricultural products and ensures product quality.

There are some problems to be discovered and solved in the actual operation process of the agricultural supply chain of agricultural super-docking vegetables. The existing literature on the supply chain performance of the agricultural super-docking mode is more about the supply chain performance evaluation research with the supply chain supermarket as the main body, lacking the overall evaluation of the supply chain and the evaluation analysis of the supply side [1-2]. Therefore, it is of theoretical significance to build a performance evaluation system and use scientific statistical analysis methods to conduct research and provide some supplements and references for the research on the agricultural supply chain management of vegetable supply chain [3-4]. Performance evaluation is a very important field in the research of the agricultural superintendent.Using the performance evaluation method to analyze the agricultural superintendent is helpful to clarify the position of farmers, supermarkets, cooperatives and other nodes in the agricultural superintendent docking mode. The influence of each node on the overall operating efficiency, and based on this, continuously adjust the entire industrial chain and improve the operation performance of the agricultural super-docking. Practical performance research can help companies find problems early, find solutions, and promote model optimization [5-6]. Therefore, effective performance evaluation is the key to promoting the development of agricultural super-learning.

In order to make the government's guidance for the production and marketing of agricultural products more effective, Yafu Tang used the analytic hierarchy process (AHP) to establish an evaluation system for the production and marketing of agricultural products. Yafu Tang selected three primary indicators and eleven secondary indicators, and established an evaluation system based on the weighted average method. In the empirical research section, Yafu Tang simulated three agricultural product management departments and tested the established model. Yafu Tang's results show that the model can well calculate the evaluation values and ranking results of the docking effect [7-8]. The docking of the agricultural super is a revolution in the field of agricultural product circulation. For both agriculture and farmers, as well as supermarket enterprises, this "revolutionary baptism" cannot be avoided. Yinqiu Liu has selected the performance evaluation

indicators of agricultural superintendent based on the research results and national policies of domestic and foreign agricultural superintendent. Yinqiu Liu used fuzzy theory and analytic hierarchy process (AHP) to analyze the combination of qualitative and quantitative analysis of agricultural superintendent, and constructed an evaluation model of agricultural superintendent, which has practical significance for the development of agricultural superintendent [9-10] .

The research purpose of this paper is to study the performance evaluation of vegetable supply chain under the agricultural super-docking mode. This paper uses the BSC model and SCOR model in the construction of performance indicators and uses the analytic hierarchy process to construct a hierarchical model of performance evaluation. The comprehensive evaluation system is based on the comprehensive evaluation system. In the selection of performance evaluation methods, the fuzzy comprehensive evaluation method that can measure difficult to quantify indicators is used to evaluate the performance of the vegetable supply chain under the agricultural super-docking mode.

2. Proposed Method

2.1. Theoretical Basis of Performance Evaluation of Vegetable Supply Chain in the Agricultural Super-Docking Mode

(1) The concept of docking agricultural super

The agricultural super-docking refers to the signing of a supply agreement between farmers and merchants to supply agricultural products directly to supermarkets from scattered farmers. It is a new type of agricultural product circulation model that is produced under the premise of the rapid development of large-scale supermarket chains and the increasing attention to food quality and safety issues. The purpose is to build a platform for high-quality agricultural products to enter the supermarket, and connect small producers with large markets to expand the consumption of agricultural products, invigorate the circulation of agricultural products, ensure the food safety of urban and rural residents, and promote the development of agricultural and rural economies. Production and marketing integration chain, to achieve a win-win situation for merchants, farmers and consumers [11-12].

(2) The concept of supply chain in the agricultural super-docking mode

"Agricultural Supermarket Docking" is a new type of optimized supply chain that eliminates the distribution link and direct cooperation between farmers and supermarkets. The product providers in "Agricultural Supermarket Docking" usually include individual farmers and various agricultural economic organizations. Supermarkets are the terminal sales of agricultural products [13]. "Agricultural Supermarket Docking" is a mature supply chain model that has been operating abroad. With the development of large supermarkets and specialized cooperatives in China, the agricultural supermarket docking model supply chain will be widely operated.

(3) Types of supply chain of agricultural super-docking mode

At present, there are three typical agricultural super-docking supply chain models in China, namely the alliance type represented by Carrefour, the contract type represented by Wal-Mart, and the integration model represented by China Resources Vanguard [14].

1) "Alliance" mode

The alliance type is the most common type of "agricultural super-docking" .Cooperatives play an intermediary role between farmers and supermarkets.Supermarkets do not need to contact farmers directly, but establish related agreements with cooperatives based on their own needs and standards. Decentralized farmers provide agricultural products on time and quality [15].

2) "Contractualization" model

Supermarkets cooperate with farmers through leading enterprises to avoid problems such as insufficient cooperative management capabilities. Leading companies often have strict product

quality testing standards, advanced logistics and distribution systems, and management experience, solving some of the transportation problems of small and medium supermarkets [16].

3) "Integrated" mode

In this model, supermarkets build their own production bases, provide financial support, technical guidance, and market information feedback to the bases, and guide the bases to produce products that meet the quality requirements of the supermarket [17].

(4) Related theories of supply chain performance evaluation

An effective supply chain can bring a series of benefits, such as cutting costs, increasing market share, gaining sustainable customer relationships, and even improving overall organizational performance [18-19]. The performance evaluation of the supply chain is a multi-level, multi-dimensional analysis and evaluation of the operating conditions of the enterprises in each node of the supply chain from an overall perspective.The main purpose is to control the operation status and operation effect of the supply chain and improve the supply chain management Provide true and reliable theoretical basis.

2.2. Performance Evaluation of Vegetable Supply Chain Based on BSC / SCOR

(1) Introduction to the model of performance evaluation of vegetable supply chain in the agricultural super-docking mode

1) Supply Chain Operation Reference Model (SCOR)

Supply chain management involves multiple enterprise nodes, that is, multiple management objects. There is a complex survival relationship between these nodes and enterprises that are interdependent and interdependent [20]. The SCOR model is applicable to supply chains in many different fields. The index system provided by the model provides node companies with a supply chain evaluation and a confirmation method for the improvement direction of the supply chain. In general, the SCOR model summarizes the entire operating process of the supply chain from three levels.The first layer is the definition layer and describes the basic process of the five supply chains from planning to return.The second layer is the configuration layer and consists of 26 types. The composition of specific indicators; the third layer is the element layer, and the type of the configuration layer is divided into more specific and detailed index elements. The entire model system provides operable practical value for the evaluation and improvement of the supply chain. At the same time, in order to improve the application value of the SCOR model, the International Supply Chain Council will regularly provide benchmarks for best practices in supply chains in various fields. By comparing and contrasting with best practices, managers can find room for improvement in supply chain operations. And adjust its management strategy in a timely manner. To sum up, the use of SCOR for supply chain evaluation in the process of enterprise supply chain management can effectively evaluate the operation of the supply chain.By referring to the best-practiced benchmarking evaluation data and quantitative analysis of its own supply chain, it can be determined and optimized. Management and operation of its own supply chain.

(2) Balanced Scorecard Model (BSC)

The balanced scorecard stands at the height of the corporate vision, and considers the performance of the four aspects of finance, customers, internal processes, and innovation capabilities. Applying BSC to the performance management of the supply chain, in addition to the four usual performance measurement dimensions of BSC, according to the management characteristics of the supply chain, the dimension of supplier management has been increased. Among them, the financial dimension measures performance from the perspective of supply chain profitability using indicators of return on assets and growth of cash flow; the customer dimension focuses on reflecting whether the supply chain products or services can meet customer needs and

create customer value; the business process dimension. Then consider the supply chain's loss in the circulation process, time flexibility; the sustainable development dimension mainly measures the flexibility of the supply chain according to market demand changes, the service quality of the supply chain products, and the ability to innovate; the supply chain management dimension is mainly about the supply chain cooperation relationship In consideration of the efficiency of product supply and communication, the stability of the supply chain supplier relationship is related to the smooth progress of supply chain transactions and affects the costs and benefits of the supply chain. The information dimension mainly considers the speed and sharing of related information such as inventory, transportation, and customer demand in the supply chain.

(3) Selection of performance evaluation indicators for vegetable supply chain in the agricultural super-docking mode

1) Financial dimension

The financial dimension is mainly concerned with the economic benefits of the entire agricultural super-docking vegetable supply chain. Four indicators, "cash turnover rate", "inventory turnover rate", "sales profit margin", and "vegetable value appreciation rate" are used for specific considerations [21] .

2) Customer dimension

The customer's feeling directly affects the overall performance and future development of the supply chain. The development and improvement of the supply chain should be oriented to meet the needs of customers in order to improve the competitiveness of the supply chain [22]. From the perspective of considering customer experience, this layer of indicators includes three indicators: "customer demand satisfaction", "customer complaint rate" and "customer retention rate" for purchasing vegetable products.

3) Operation process dimension

The operation dimension involves two parts, one is to examine the management of the internal operation of the supply chain, and the other is to examine the interconnection between the docking subjects [23]. Since the agricultural super-docking vegetable supply chain involves multiple subjects, and there are differences in the organizational models, strategic planning, and culture between the subjects, the situation of the docking relationship will also affect the performance of the supply chain. This section uses the "docking default rate", " The stability of the docking relationship is measured; and the other part of the internal operation of the supply chain is mainly examined from the level of logistics and distribution. The logistics dimension measures the logistics efficiency of the agricultural supply chain and whether the logistics system has complete infrastructure, including "supply." Three specific indicators: chain response speed, cargo damage rate, and logistics infrastructure completeness.

4) Quality safety dimension

The quality and safety of food is the focus of national life. The quality and safety dimension examines the quality and safety of agricultural products docked with vegetables. The quality and safety of vegetables directly affects the performance of the supply chain and is a key factor for the sustainable development of the supply chain. [24] . Fertilizers, pesticides, etc. are needed to assist in the growing process of vegetables, so it is particularly important to check the freshness and pesticide residues of vegetable products. It is measured by three specific indicators: "freshness of vegetables", "greenness of vegetables" and "recycling rate of packaging materials".

5) Information management dimension

Because the supply chain involves multiple enterprise nodes, the transmission of information in upstream and downstream enterprises is prone to "bull-whip effect" due to distortion or amplification. Therefore, information flow is a problem that needs special attention in the management of supply chain [25]. The agricultural super-docking vegetable supply chain needs to

exchange important information such as product prices, supply and demand, logistics, and funds. Therefore, the transmission and management of information in its supply chain is still a measure of performance that cannot be ignored. This article considers three indicators: the timeliness of information transmission, the accuracy of information, and the degree of information interaction.

(4) Determination of weights of performance evaluation indicators for vegetable supply chain in the agricultural super-docking mode

1) Construction of performance evaluation hierarchy model

This paper uses AHP to construct a hierarchical model of performance evaluation.

The basic idea of the analytic hierarchy process is to first hierarchically multi-objective decision-making problems that are difficult to measure directly and accurately, use multiple qualitative or quantitative indicators to quantify the decision-making objectives, construct a judgment matrix, and invite multiple experts to the indicators of each dimension and level After comparing and scoring, the maximum eigenvalue of the matrix is finally used to obtain its relative importance, and the quantitative basis of the final decision is obtained.

2) Formulation of comment set

The comment set is a collection of various subjective evaluations made by the survey of the performance level of the vegetable supply chain under the agricultural super-docking mode. This article selects five comment sets, which are very consistent, more consistent, generally consistent, and less consistent. Well not very much.

3) Consistency inspection

In order to determine the consistency of the weighted data opinions, a consistency judgment matrix is obtained and the consistency test is performed. The formula is as follows:

$$C.I = \frac{\lambda_{\max} - n}{n-1} \quad (1)$$

When $C.I = 0$, the indicators are consistent; otherwise, experts should be repeatedly consulted on the difference indicators to adjust and then check the consistency ratio. The formula is as follows:

$$C.R = \frac{C.I}{R.I} \quad (2)$$

If $C.R < 0.1$, the judgment matrix is consistent; otherwise, the judgment matrix needs to be adjusted. By using multiple consistency correction algorithms to calculate, choose the appropriate algorithm for correction, and finally ask the experts based on the revised data to give judgment matrix data evaluation and improvement opinions. Is the effective weight of the performance evaluation index.

2.3. Performance Evaluation Based on Fuzzy Comprehensive Evaluation Method

(1) Model selection

In order to carry out a comparatively comprehensive evaluation of the set evaluation system, this paper chooses the fuzzy comprehensive evaluation method. This method is developed on the basis of fuzzy mathematical membership theory. The influential factors that are difficult to quantify have achieved the purpose of evaluating and analyzing the membership status of multiple influencing factors on the target variable. The fuzzy comprehensive evaluation method can convert difficult problems to quantitative evaluation, and the analysis process and results are clear and clear.

(2) Model establishment

The fuzzy comprehensive evaluation model is composed of the following sets: set index set,

comment set, score set, etc.

1) Determine the influence factor set and comment set

The influencing factor set can also be called the indicator set. We use the symbol W to represent, select and determine the first-level indicator set $W=\{w_1,w_2,\Lambda\ ,w_n\}$, and w_i represents the influencing factor (the first-level indicator). There are n set. The secondary indicator set corresponding to each primary indicator is $W=\{w_{i1},w_{i2},\Lambda\ ,w_{ij}\}$, and w_{ij} represents the j impact factor (secondary indicator) corresponding to each primary indicator. In this questionnaire survey, this article divides the respondents 'evaluation results of each factor into: very non-conforming, less consistent, generally consistent, more consistent, and very consistent.The respondents' set of comments is: V = {Very Inconsistent Less Inconsistent General Conformed More Conformed Very Conformed}.

2) Determine the evaluation vector

This article uses the selection percentage of each index question on each option as the evaluation vector in the fuzzy evaluation system, namely:

$$\overline{R}=\begin{bmatrix} r_{11} & \Lambda & r_{1n} \\ \mathrm{M} & \mathrm{O} & \mathrm{M} \\ r_{n1} & \Lambda & r_{nn} \end{bmatrix} \quad (3)$$

3) Determine the weight

The distribution of fuzzy weights follows the principle of equal distribution, that is,

$$\overline{A}=\left[\frac{1}{n},\frac{1}{n},\Lambda\ ,\frac{1}{n}\right] \quad (4)$$

4) Determine membership matrix

Available from the determined evaluation vectors and weights, the fuzzy evaluation set is:

$$\overline{B}=\overline{A}\times\overline{R}=\begin{bmatrix}\frac{1}{n} & \frac{1}{n} & \Lambda & \frac{1}{n}\end{bmatrix}\times\begin{bmatrix} r_{11} & \Lambda & r_{1n} \\ \mathrm{M} & \mathrm{O} & \mathrm{M} \\ r_{n1} & \Lambda & r_{nn} \end{bmatrix} \quad (5)$$

5) Calculation of evaluation score

Set the fuzzy evaluation quantization set, that is,

$$S=\begin{bmatrix}1 & 2 & 3 & 4 & 5\end{bmatrix} \quad (6)$$

Then, the calculation formula for the evaluation score is:

$$N_{\text{total}}=\overline{B}\times S^T \quad (7)$$

3. Experiments

3.1. Research Methods

The research methods adopted in this article are summarized as follows:

(1) Literature research method

Collected domestic and foreign literatures related to "Agricultural Supermarket Docking",

agricultural product supply chain and supply chain performance evaluation. Based on reading a large amount of literature, the authors grasped the research status and results of the research subject.

(2) Questionnaire survey method

The field supply and questionnaire surveys were used to investigate the vegetable supply chain of the agricultural super-docking mode, and a large amount of valuable data were obtained to ensure the authenticity, accuracy, and reliability of the research analysis in this paper.

(3) Empirical analysis method

This paper collects data by issuing questionnaires, and selects scientific and effective performance evaluation methods to analyze empirical data.

3.2. Questionnaire Design

The data used in this research comes from field surveys.The main participants are farmers who join the agricultural supply chain, vegetable production bases and supermarkets of professional farmers' cooperatives.The survey content consists of two parts. The first part is the basic situation of the respondents. The second part is a survey question based on the performance evaluation indicators of the agricultural supply chain for the vegetable supply chain.

3.3. Data Acquisition

In order to ensure the authenticity of the data, this article mainly relies on field surveys to obtain first-hand data. In order to comprehensively understand the development of the agricultural super agricultural docking model in different regions, scientific and reasonable planning of the research objects, research sites, and research methods, and to understand the agricultural super agricultural docking development model through field surveys.

Secondly, the questionnaire distribution in this article is mainly based on supermarkets, and a certain area is selected as the survey object. The supermarkets surveyed are: Century Lianhua, Jiajiale, Sanjiang Shopping, China Resources Vanguard, Carrefour and so on. There were 250 questionnaires actually issued, a total of 245 were returned, and 240 valid questionnaires. The effective recovery rate of this questionnaire was 96%. In order to ensure the reliability and representativeness of the survey samples, this paper first conducts field surveys on the selected 20 supermarkets, and then selects the farmers who have established a cooperative relationship with the agricultural supermarket, conducts questionnaire surveys and interviews, and understands the basic situation of both parties.

4. Discussion

4.1. Descriptive Statistical Analysis of the Subjects of This Questionnaire.

(1) Gender of the surveyed person

According to the statistical analysis sample, the “male” of the surveyed persons is relatively large, 60.8% of “male” and 39.2% of “female”, as shown in Table 1:

Table 1. The gender statistics of investigators

Gender	Number Quantity	Hundred percent
Male	146	60.8%
Female	94	39.2%
Amount to	240	100%

(2) Age of the person under investigation

According to the statistical analysis sample, the ages of workers in production cooperatives, farmers and supermarkets are mostly “41-50 years old”, accounting for 39.58%, followed by “51-60 years old”, accounting for 35.83% As shown in Table 2:

Table 2. The age statistics of investigators

Age	Number Quantity	Hundred percent
Under 30 years old	9	3.75%
31-40 years old	42	17.5%
41-50 years old	95	39.58%
51-60 years old	86	35.84%
Over 60 years old	8	3.33%
Amount to	240	100%

(3) Join the agricultural super-docking time

According to the statistical analysis samples, the survey participants' joining time to the agricultural superconductor is mostly "1 to 2 years", accounting for 45%, followed by "2 years or more" cooperation time accounting for 30%, as shown in Table 3.

Table 3. The time of join the farming-supermarket docking statistics of investigators

Duration	Number Quantity	Hundred percent
0-3 months	2	5%
Within 1 years	8	20%
1 to 2 years	18	45%
More than 2 years	12	30%
Amount to	40	100%

4.2. Fuzzy Evaluation Analysis

(1) Financial dimension

The actual performance of the “financial dimension” of the agricultural supply chain for the vegetable supply chain is shown in Figure 1 and Table 4.

Table 4. Percentage of "financial dimension" performance of agricultural supermarket docking vegetable supply chain

	Very inconsistent	Less consistent	Generally in line with	More in line with	Very in line with
Cash Turnover	0.0%	2.7%	46.6%	46.6%	4.1%
Survival turnover	0.0%	5.5%	58.9%	29.5%	6.2%
Sales turnover	0.7%	4.1%	54.8%	32.9%	7.5%
Value added rate of vegetables	0.0%	1.4%	46.6%	45.2%	6.8%

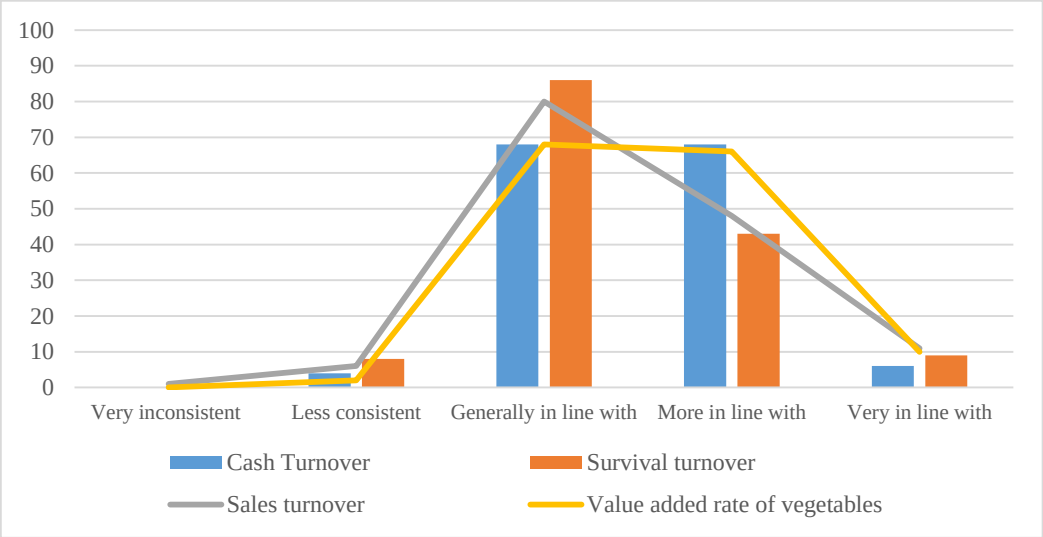

Figure 1. The actual performance frequency of "financial dimension" performance of agricultural super docking vegetable supply chain

According to the statistical results of the frequencies and percentages in Figure 1 and Table 4, the selection percentage of each finger title on each option will be used as the evaluation vector in the fuzzy evaluation system. We can get the evaluation vector of the actual performance of the "financial dimension" performance of the vegetable supply chain in the agricultural supermarket, and then we can get it based on the results of the hierarchical analysis. for:

$$\overline{B} = \overline{A} \times \overline{R} = [0.003 \quad 0.034 \quad 0.524 \quad 0.370 \quad 0.068] \tag{8}$$

It can be seen that for the respondents, they believe that the performance of the “financial dimension” of the agricultural supply chain for the vegetable supply chain is “generally consistent” (ie, 0.524). In addition, according to the quantified set of fuzzy evaluation terms, then the respondents' evaluation scores on the "financial dimension" of the agricultural supply chain for the vegetable supply chain were:

$$N_{\text{total}} = \overline{B} \times S^T = 3.464 \tag{9}$$

(2) Customer dimension

Table 5 and Figure 2 show the actual performance analysis results of the "customer dimension" of the agricultural supply chain for the vegetable supply chain.

Table 5. Performance percentage of "customer dimension" of agricultural supermarket docking vegetable supply chain

	Very inconsistent	Less consistent	Generally in line with	More in line with	Very in line with
Customer demand satisfaction	2.1%	0.0%	44.5%	47.3%	6.2%
Customer complaint rate	0.0%	1.4%	61.0%	23.3%	14.4%
Customer retention rate	0.0%	2.1%	38.4%	54.1%	5.5%

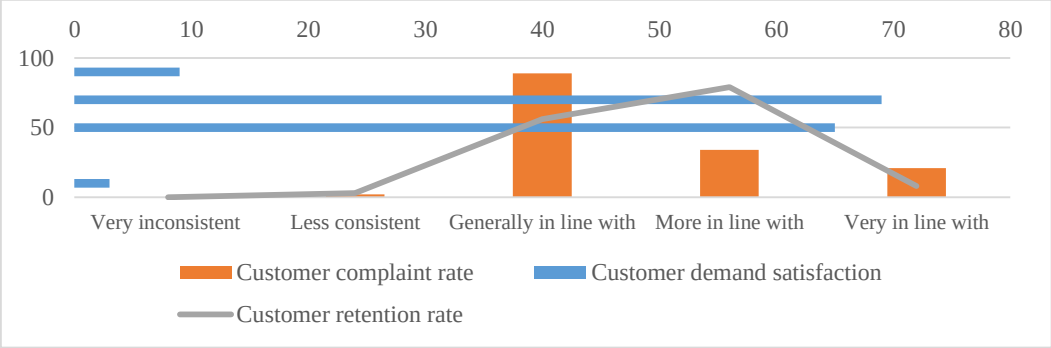

Figure 2. Frequency of "customer dimension" performance of agricultural supermarket docking vegetable supply chain

According to the statistical results of the frequencies and percentages in Table 5 and Figure 2, the selection percentage of each option on each option will be used as the evaluation vector in the fuzzy evaluation system. Then you can get the evaluation vector of the actual performance of the "customer dimension" performance of the agricultural supply chain for the vegetable supply chain. In addition, according to the previous hierarchical analysis results, you can get the fuzzy weight distribution of the "customer dimension" of the vegetable supply chain for the agricultural supply chain. The fuzzy evaluation set is:

$$\overline{B} = \overline{A} \times \overline{R} = [0.005 \quad 0.014 \quad 0.425 \quad 0.389 \quad 0.140] \tag{10}$$

It can be seen that for the respondents, they considered that the performance of the "customer dimension" in the agricultural super-docking mode was "generally consistent" (ie 0.425). In addition, according to the quantified set of fuzzy evaluation terms, then the respondents' evaluation scores on the "customer dimension" performance of the agricultural supply chain for the vegetable supply chain were:

$$N_{\text{total}} = \overline{B} \times S^T = 3.592 \tag{11}$$

(3) Operation process dimension

Table 6 and Figure 3 show the actual performance analysis results of the "operation process dimension" performance of the agricultural supermarket docking vegetable supply chain.

Table 6. Performance percentage of "operation process dimension" of agricultural supermarket docking vegetable supply chain

	Very inconsistent	Less consistent	Generally in line with	More in line with	Very in line with
Docking default rate	0.0%	13.0%	35.6%	50.0%	1.4%
Stability of docking relationship	0.7%	16.4%	37.0%	45.2%	0.7%
Supply chain response speed	0.0%	9.6%	27.4%	56.8%	6.2%
Damage rate of goods	0.7%	17.1%	37.7%	39.7%	4.8%

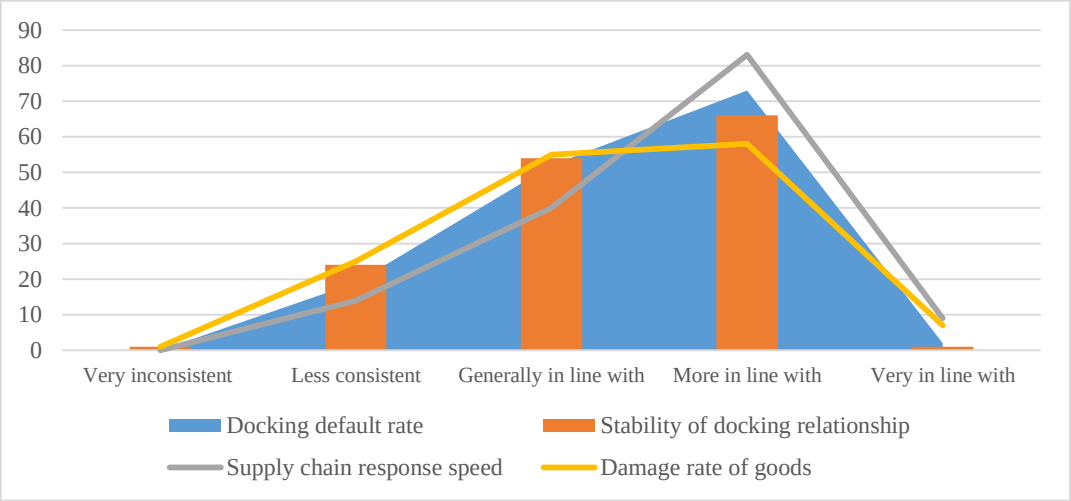

Figure 3. Performance frequency of "operation process dimension" of agricultural supermarket docking vegetable supply chain

According to the statistical results of frequency and percentage in Table 6 and Figure 3, the selection percentage of each question in each option will be used as the evaluation vector in the fuzzy evaluation system. Then we can get the evaluation vector of the actual performance of the "operation process dimension" of the agricultural supermarket's docking vegetable supply chain. In addition, according to the above analytic hierarchy process results, we can get the fuzzy weight distribution of each topic of the "operation process dimension" of the agricultural supermarket's docking vegetable supply chain, then the fuzzy evaluation set is:

$$\overline{B} = \overline{A} \times \overline{R} = [0.015 \quad 0.160 \quad 0.355 \quad 0.451 \quad 0.019] \tag{12}$$

Therefore, for the respondents, they think that the performance of "operation process dimension" under the docking mode of agricultural supermarket is "generally consistent" (i.e. 0.451). In addition, according to the fuzzy evaluation set, the respondents' evaluation scores on the "operation process dimension" performance of the agricultural supermarket docking vegetable supply chain are as follows:

$$N_{\text{total}} = \overline{B} \times S^T = 3.298 \tag{13}$$

(4) Quality safety dimension

Table 7 and Figure 4 show the actual performance analysis results of the "quality and safety dimension" performance of the agricultural supermarket docking vegetable supply chain.

Table 7. Performance percentage of "quality and safety dimension" of agricultural supermarket's docking vegetable supply chain

	Very inconsistent	Less consistent	Generally in line with	More in line with	Very in line with
Freshness of vegetables	0.0%	0.0%	32.2%	52.1%	15.8%
Greenness of vegetables	0.0%	0.0%	39.0%	28.8%	32.2%
Recycling rate of packaging materials	0.0%	5.5%	52.7%	37.0%	4.8%

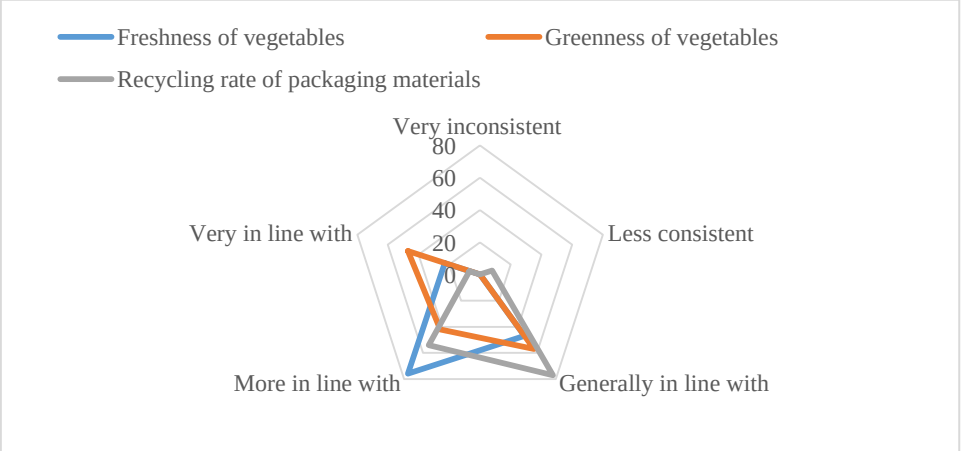

Figure 4. Performance frequency of "quality and safety dimension" of agricultural supermarket docking vegetable supply chain

According to the statistical results of frequency and percentage in Table 7 and Figure 4, the selection percentage of each question in each option will be used as the evaluation vector in the fuzzy evaluation system. Then we can get the evaluation vector of the actual performance of the "quality and safety dimension" performance of the agricultural supermarket docking vegetable supply chain. In addition, according to the results of the previous AHP, we can get the fuzzy weight distribution of each topic of the "quality and safety dimension" of the agricultural supermarket docking vegetable supply chain, then the fuzzy evaluation set is:

$$\overline{B} = \overline{A} \times \overline{R} = [0.000 \quad 0.011 \quad 0.383 \quad 0.419 \quad 0.187]_{(14)}$$

Therefore, for the respondents, they think that the performance of "quality and safety dimension" in the docking mode of Agricultural University is "generally consistent" (i.e. 0.419). In addition, according to the fuzzy evaluation set, the respondents' evaluation scores on the "quality and safety dimension" performance of the agricultural supermarket docking vegetable supply chain are as follows:

$$N_{\text{total}} = \overline{B} \times S^T = 3.782_{(15)}$$

5) Information management dimension

Table 8 and Figure 5 show the actual performance analysis results of the "quality and safety dimension" performance of the agricultural supermarket docking vegetable supply chain

Table 8. Performance percentage of "information management dimension" of agricultural supermarket docking vegetable supply chain

	Very inconsistent	Less consistent	Generally in line with	More in line with	Very in line with
Timeliness of information transmission	7.5%	1.4%	56.8%	34.2%	0.0%
Information interaction	17.8%	0.0%	67.8%	14.4%	0.0%
Information accuracy	2.7%	8.2%	67.8%	19.9%	1.4%

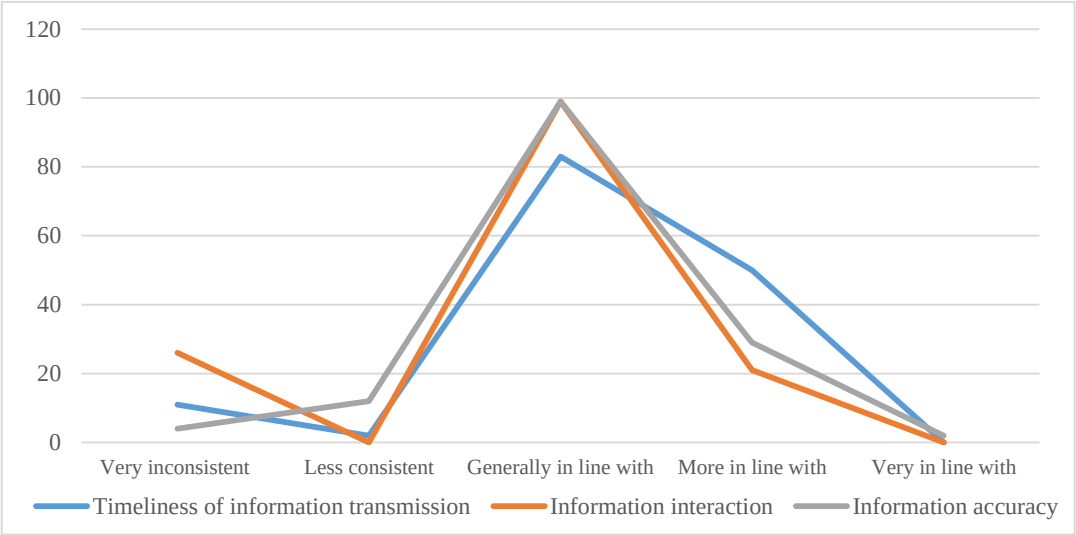

Figure 5. Performance frequency of "information management dimension" of agricultural supermarket docking vegetable supply chain

According to the statistical results of frequency and percentage in Table 8 and Figure 5, the selection percentage of each question in each option will be used as the evaluation vector in the fuzzy evaluation system. Then we can get the evaluation vector of the actual performance of the "information management dimension" performance of the agricultural supermarket docking vegetable supply chain. In addition, according to the results of the previous AHP, we can get the fuzzy weight distribution of each topic of the "information management dimension" of the agricultural supermarket docking vegetable supply chain, then the fuzzy evaluation set is:

$$\overline{B} = \overline{A} \times \overline{R} = [0.072 \quad 0.045 \quad 0.644 \quad 0.233 \quad 0.007] \tag{16}$$

Therefore, for the respondents, they think that the performance of "information management dimension" under the docking mode of Agricultural University is "generally consistent" (i.e. 0.644). In addition, according to the fuzzy evaluation set, the respondents' evaluation scores on the "information management dimension" performance of the agricultural supermarket docking vegetable supply chain are as follows:

$$N_{\text{total}} = \overline{B} \times S^T = 3.058 \tag{17}$$

Combined with the above, the fuzzy evaluation results of the performance evaluation index system of the agricultural supermarket docking vegetable supply chain are obtained, as shown in Table 9

It can be seen from Table 9 that in the fuzzy evaluation results of the performance evaluation index system of the agricultural supermarket docking vegetable supply chain, the overall score of the performance evaluation of the agricultural supermarket docking vegetable supply chain is 68.279, indicating that the respondents' performance evaluation of the agricultural supermarket docking vegetable supply chain is medium. From the perspective of criterion level, the average score of agricultural supermarket docking vegetable supply chain in "quality and safety dimension C4" is the highest, 75.645 points; while the average score in "information management dimension C5" is the lowest, 61.154 points. The ranking of the performance evaluation results of each criteria level of the agricultural supermarket docking vegetable supply chain from high to low is: quality and safety dimension C4 > customer dimension C2 > financial dimension C1 > operation process

dimension C3 > information management dimension C5.

Table 9. Performance evaluation index weight of vegetable supply chain under the docking mode of agricultural supermarket

Target layer	Centesimal score	Standard layer	Centesimal score
Performance evaluation index system C under the mode of agricultural super docking	68.279	Financial dimension C1	69.286
		Customer dimension C2	71.840
		Operation process dimension C3	65.962
		Quality safety dimension C4	75.645
		Information management dimension C5	61.154

4.3. Horizontal Comparative Analysis on the Performance of Vegetable Supply Chain in the Mode of Agricultural Super Docking

In this paper, we evaluate the performance of the docking vegetable supply chain by contract, integration and alliance, and get the scores of the three types of docking in different dimensions. We analyze the impact of the three types of docking vegetable supply chain on the performance by comparison. According to the above fuzzy comprehensive analysis method for the performance of the agricultural super docking vegetable supply chain, the survey data is divided into different types of "agricultural super docking", and the evaluation scores of the three different types of agricultural super docking vegetable supply chain performance can be obtained similarly, as shown in Figure 6.

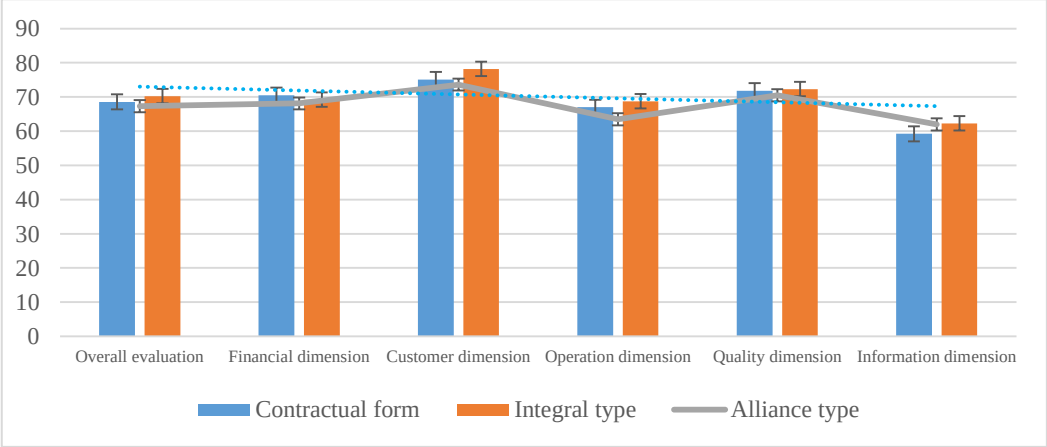

Figure 6. The performance evaluation scores of three types of farming-supermarket docking vegetable supply chain

It can be seen from Figure 6 that in the dimension of financial indicators, the score of contracted agricultural supermarket docking is the highest, followed by integrated agricultural supermarket docking, and the score of alliance agricultural supermarket docking is the lowest, mainly because

cooperatives do not have a special distribution Department, so the logistics and transportation problems have not been effectively solved, and the cost has increased, because this alliance agricultural supermarket has a low score in this dimension. The leading company or the third-party logistics that cooperates with the company in the contract type of agricultural supermarket docking undertakes the packaging and transportation of products, and the third-party logistics company undertakes the loss and solves the problem of transportation cost. The integrated docking of agricultural supermarkets is due to the establishment of its own production base, which reduces the cost of procurement and logistics, but has a large investment, labor cost, equipment cost and so on.

5. Conclusions

With the development of agricultural product market and the improvement of agricultural product demand, "agricultural super docking" will be more promoted. Compared with the traditional agricultural product supply chain, "agricultural super docking" has improved the efficiency of the supply chain, but it still needs to be improved and improved. In this paper, through the study of relevant theories, on the basis of literature research, through the construction of the performance evaluation index system of the agricultural super docking vegetable supply chain, we get the current performance of the agricultural super docking vegetable supply chain, and compare the performance of different types of agricultural super docking.

Based on BSC and SCOR model, this paper designs a performance evaluation system which includes five dimensions, including financial dimension, customer dimension, operation process dimension, quality and safety dimension and information management dimension. It aims to establish a more scientific and reasonable performance evaluation system and get more accurate evaluation results. This paper uses the established performance evaluation system, obtains the evaluation results of the performance of the docking vegetable supply chain by the empirical investigation, and the impact of each index dimension on the performance, and makes a comparative evaluation and analysis of the performance of three different types of docking vegetable supply chain.

In this paper, we find that the overall performance level of the agricultural super docking vegetable supply chain is in the middle, among which, the performance scores of quality safety and customer dimensions are higher, while the performance of financial, operation process and information management dimensions still need to be improved. By comparing the performance of different types of agricultural super docking vegetable supply chain in various dimensions, we find that the performance scores of integrated and contractual agricultural super docking vegetable supply chain in customer dimension, operation dimension and quality safety dimension are higher than that of alliance.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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