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Optimization of Supply Chain Operation for Agricultural Products under the Development of Big Data in Taiyuan City

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Abstract: Special geographical location and pleasant climate have created a diverse ecological environment in Taiyuan City, which creates good conditions for the development of agriculture, and the supply chain of agricultural products has thus flourished. With the advancement of information technology and the digital countryside strategy, the application of big data in the supply chain of agricultural products is gradually becoming widespread. By using big data as the main focus and analyzing the operation of the agricultural products supply chain in Taiyuan, this paper explores the operation mechanism of the agricultural product supply chain. It also combines the research results of agricultural supply chain operation to construct a general framework for the agricultural product supply chain. The issues are summarized in the process, such as simple operation structure of agricultural product supply chain in Taiyuan, low level of information, coordination of interests between subjects still need to be improved, and insufficient scientific and technological support in the transportation link. Accordingly, pertinent recommendations are made in order to optimize the agricultural products supply chain link, enhance efficiency and support agriculture growth in Taiyuan.

Keywords: agricultural product supply chain; supply chain operation mechanism; information transmission mechanism; big data

1. Introduction

Shanxi is located in the east of the Loess Plateau and west of the Taihang Mountains, one of the birthplaces of Chinese civilisation. With complex topography, abundant precipitation, and deep soil, it is suitable for the growth of crops. Agricultural products such as cereals, oats, jujube, and walnut are widely welcomed by both domestic and foreign markets. The production, circulation and sales of agricultural products all depend on the operation of the agricultural supply chain. The upgrading and improvement of the agricultural supply chain is the need to guarantee food security and basic information, but also the need to realise wealth and common prosperity. The era of big data is a great opportunity for the reshaping and renewal of the agricultural supply chain, and the operation mechanism of the agricultural supply chain is a key part of its improvement.

In 2000, China published the first article on the agricultural supply chain, marking the relatively late start of research on this topic. With the acceleration of China's agricultural industrialisation process, supply chain management research has gradually focused on its application in the production, processing and transportation of agricultural products. Guo analyzed the effective application of supply chain management, pointing out

that the core of supply chain management is effective coordination, while the core of agricultural industrialization is operation. The application of supply chain management in agricultural industrialization will greatly enhance the competitiveness and development of agricultural industrialization [1]. GuoHua and Wei believe that considering the natural characteristics of agricultural products and their production and distribution characteristics, the supply chain operation of agricultural products has its own unique features. Its main features are: agricultural logistics greatly affects the efficiency of agricultural supply chain operation, the main products in the agricultural supply chain have inconsistent quality standards, and the agricultural supply chain is conducive to value-added activities such as distribution and processing of agricultural products [2]. In order to optimise and upgrade the agricultural supply chain, it is necessary to understand the operation and mechanism of the agricultural supply chain. It believes that supply chain operation can be understood as the joint operation of multiple resources centred on the core enterprise, effectively integrating information, logistics, capital and other node resources, in order to create greater value or enhance their competitiveness. With the rapid development of Internet technology, more and more scholars began to pay attention to big data. Brynjolfsson E indicated that big data is to analyse and deal with all the data instead of applying the method of random sampling [3]. At present, the definition of big data is mainly from the perspective of static resources and dynamic capabilities [4]. However, so far, there are fewer studies on the agricultural supply chain and its mechanism operation in Taiyuan City, and the relevant contents of the development of the agricultural supply chain in the context of big data still need to be added.

To sum up, this paper takes the agricultural supply chain as the main line, conforms to the status quo of the development of agricultural supply chain in Taiyuan City, and analyses the three aspects of the supply chain operation mechanism, namely, information transmission, subject contract and synergistic operation, on the basis of existing relevant literature, and strives to find new paths to optimize the operation of the supply chain of agricultural products in Taiyuan City, so as to provide theoretical ideas for the optimization and upgrading of the supply chain of agricultural products in Taiyuan City. The research methods used in this paper include the literature research method, empirical analysis method and qualitative analysis method.

2. Analysis of Agricultural Supply Chain Operation in Taiyuan City

Cao et al. believe that the agricultural supply chain involves multiple participants, including agricultural producers, enterprises, wholesale and retail markets, and consumers. It connects all the links of production, processing, transport, and sales of agricultural products. The integration of logistics, capital flow, and information flow is crucial for building a network comprising agricultural product suppliers, manufacturers, distributors, retailers, and final consumers. This integration enables business collaboration, information sharing, risk sharing among participants, and ultimately leads to value-added agricultural products and a multi-win agricultural supply chain [5]. This paper introduces and analyses the current situation of agricultural supply chain in Taiyuan City from three aspects: supply chain operation structure, inter-agency cooperation, and information management, drawing on the concept of agricultural supply chain mentioned above.

2.1. Single Structure of Agricultural Products Supply Chain Operation in Taiyuan City

Taiyuan City is located in the central part of Shanxi and the northern part of the Taiyuan Basin, with the Fen River running across the whole territory, making it the political, economic, and cultural centre of Shanxi Province. It is also an important distribution centre for agricultural products in North China, with major agricultural products such as Qingxu grapes, Jinci rice, and Yangqu millet [6]. At the same time, the production and marketing of agricultural products in Taiyuan is highly seasonal, with exports dominating in spring and summer and imports dominating in autumn and winter. In recent years,

Taiyuan's economy has developed sequentially, but its economic and industrial structure is still irrational. Compared with other cities, Taiyuan's GDP is the highest in Shanxi, but the gross output value of agriculture, forestry, animal husbandry, sideline, and fishery industries is only ranked 10th in the province (Figure 1). The tertiary industry in Xiaodian District and other major urban areas is well developed, with a total tertiary industry GDP of about 567.2 billion in 2020, accounting for 21.7% of the total tertiary industry GDP in Taiyuan in the same year. In comparison, the marginal and peripheral urban areas such as Jiancaoping District and Qingxu County are still industrial-type and traditional agriculture, and the total GDP of primary industry in Qingxu County will be about 10.1 billion in 2020, accounting for 31.4% of the total GDP of primary industry in Taiyuan City in the same year.

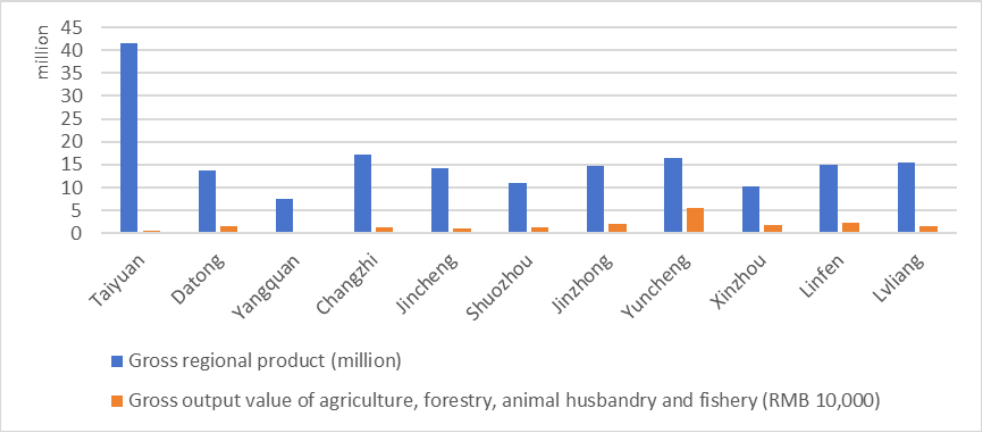

Figure 1. Comparison of GDP and Total Output Value of Agriculture, Forestry, Animal Husbandry and Fishery by City in Shanxi Province in 2020.

Data source: Shanxi Statistical Yearbook (2021)

Under the dual influence of the natural and socio-economic environments, the supply chain structure of agricultural products in Taiyuan City is relatively simple, with farmers-wholesalers-farmers' markets/hypermarkets-consumers as the main focus. Under this structure, the distribution bodies in the agricultural supply chain are highly dispersed across different locations and time periods, mostly concentrated in the agricultural areas of Jinyuan Pingchuan, the suburban areas of Chuanqian in the north, and the modernized agricultural areas in the south. Due to the lack of modern infrastructure and low prices paid to farmers for their agricultural products, the distribution of agricultural products is more costly and less efficient. Additionally, the slow-selling of crops sometimes greatly affects farmers' motivation to produce.

2.2. Co-operation between the Main Bodies of the Supply Chain Is Becoming More Diversified and Mutually Beneficial

The main subjects of the agricultural supply chain include: suppliers (agricultural producers), manufacturers (agricultural processors), sellers (wholesale and retail of agricultural products) and consumers. In the traditional supply chain, the number of small and medium-sized suppliers is large, providing many options for cooperation, which affects the stability and transformation of cooperation, and there is a lack of a reasonable trust mechanism to guarantee cooperation; the main bodies of agricultural supply chain emphasize more on the price in the cooperation, and most of them rely on the random picking of the agricultural products into the warehouse and the checking and controlling of quality, which can't be guaranteed to a large extent; meanwhile, the supply chain lacks effective information exchange and communication. At the same time, there is a lack of effective information exchange and technical support between the main bodies of the supply chain, and the efficiency of cooperation is low.

Due to the many shortcomings of traditional cooperation between supply chain subjects, along with the decentralized operation and production mode of agricultural products in Taiyuan, as well as the natural characteristics of agricultural products (such as perishable goods and variety), the competition in the vegetable market has become increasingly fierce. As a result, the agricultural supply chain in Taiyuan City has actively diversified its cooperation among subjects, aiming to provide consumers with high-quality, low-priced, and safe agricultural products, thus enhancing the competitiveness of each subject in the supply chain. This will enhance the competitiveness and supply chain value of each subject in the supply chain.

Supply chain partnership refers to the supplier-manufacturer relationship, seller-buyer relationship, and supplier relationship, which can be viewed as a contractual relationship between suppliers and manufacturers in terms of sharing information, sharing risks, and sharing benefits [7]. In recent years, producers and intermediaries in the agricultural supply chain in Taiyuan City have actively developed partnerships, which are presented as an example in the case of Yixin Agricultural Machinery Professional Co-operative in Shanxi Province. Yixin Agricultural Machinery Professional Co-operative Society is located in Nitun Village, Nitun Town, Yangqu County, Taiyuan City, and mainly operates small grains processing and sales, agricultural machinery operation and maintenance, etc., while the farmers in Nitun Town mostly plant corn, cereals and beans, the farmers and the co-operative society cooperate to provide high-quality food crops while obtaining a higher economic value. Yixin agricultural machinery professional co-operatives also undertake Yangqu County's comprehensive utilization of crop straw projects, with their own technology back to the countryside, to achieve a win-win effect.

2.3. Big Data Empowers the Information Management of Agricultural Supply Chain

In recent years, with the proposed structural reform of the agricultural supply side, the supply chain of agricultural products in Taiyuan City has also undergone constant changes, and big data and Internet technology have provided significant opportunities for the optimisation of the agricultural supply chain. Hu believes that the key to the information management of the agricultural supply chain lies in applying the idea of integration to the entire supply chain system, transforming each product into an information node, sensing real-time information about agricultural products through sensors, and realizing the connection between crops and the Internet. The use of big data technology in the process of production, processing, transport, and sales of agricultural products can effectively guarantee the stability of the agricultural supply chain, meet the demand for information resources of enterprises in the supply chain, achieve product information sharing, and improve the quality of service and supply efficiency of agricultural products [8].

The agricultural supply chain in Taiyuan City has gradually used big data technology and widely applied information technologies such as identification barcodes, electronic data interchange (EDI), radio frequency identification (RFID) and the Internet of Things (IoT). Agricultural products production introduces QR code and RFID technology to efficiently monitor the production process, reasonably control the temperature, humidity and soil nutrients, pay attention to the growth dynamics of agricultural products in the form of data, strictly control the quality, and ensure product quality; With the help of information technology, effective supervision is carried out in the circulation of agricultural products to ensure the safety of the products in the process of processing, storage, transport, delivery, and sales; thanks to the information technology management, consumers' right to know can be expanded, alleviating food safety anxieties and concerns. The consumer's right to know is expanded, food safety anxieties and concerns are alleviated, and comprehensive information on agricultural products is better understood.

Optimise the transport of agricultural products using big data. The short life cycle and freshness demanded by consumers determine the importance of the timing of

transport. In recent years, large-scale agricultural suppliers in Taiyuan have made use of big data technology and cold-chain logistics in transport to have better control over transport time and routes, reducing transport costs while greatly ensuring the quality of agricultural products. Thanks to this, urban and rural residents in Taiyuan are able to enjoy a wider variety of fresh produce.

Optimise warehousing using big data. Warehousing is an important part of the supply chain operation, with the development of big data, big data technology in the warehousing link is also more and more prominent. Taiyuan City, a large agricultural wholesaler based on big data and other science and technology, to build an agricultural warehousing logistics management system, which greatly promotes the integrated development of agricultural products. Through the operation of the system, logistics information can be quickly retrieved and uploaded to provide technical support for the overall operation of logistics, which not only improves the operational efficiency but also saves the operational cost of the enterprise logistics link.

3. Supply Chain Operation Mechanism of Agricultural Products in Taiyuan City

This paper adopts Liu Haiyun's perspective that supply chain operation can be understood as the joint operation of multiple resources centered on the core enterprise, effectively integrating information, logistics, capital, and other resources at different nodes to create greater value and enhance competitiveness. Due to the unique commodity attributes of agricultural products, the supply chain of agricultural products has several key characteristics: information asymmetry between various links, complexity in the subjects involved, and certain challenges in managing the supply chain. As a result, the operation of agricultural product supply chains differs significantly from other types of supply chains. With the development of the supply chain and the continuous application of big data technology, the agricultural supply chain has gradually appeared as a multi-faceted operation mechanism, and the following is an analysis and research on the information transmission mechanism, the main contract mechanism and the cooperative operation mechanism of the agricultural supply chain in Taiyuan City.

3.1. Agricultural Supply Chain Information Transmission Mechanism

Agricultural supply chain producers are mostly decentralized farmers who, compared to upstream dealers and leading enterprises, have fewer information sources and are prone to information asymmetry. The information conduction mode in a traditional supply chain is the two-way information flow mode in the chain (Figure 2). Information interaction mainly occurs between neighboring node enterprises or links, and the lack of overall collaboration in supply chain information management leads to delays and significant distortions in the information circulation process. With the development and application of big data technology, the collaborative information flow model (Figure 3) is gradually evolving. Under this emerging model, the information of each node is efficiently collected and processed through the information channel, and displayed in the information centre, so as to achieve real-time sharing of information. The members of the supply chain take the processing and operation of information flow as the core, aiming to improve the competitiveness of the supply chain and realise information collaboration on the basis of information sharing [9].

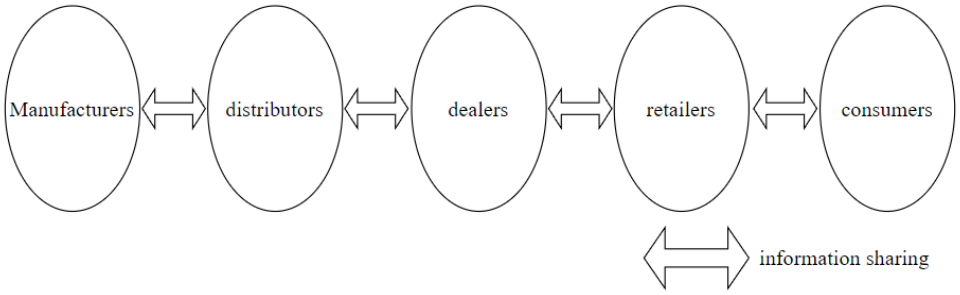

Figure 2. Chained Bidirectional Information Flow Model.

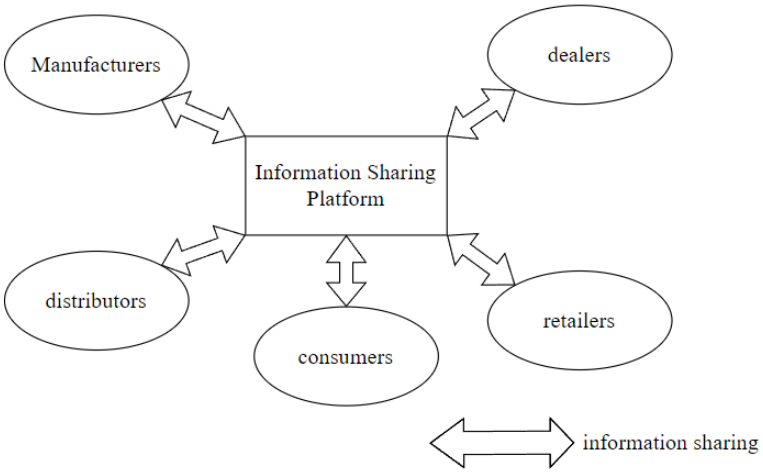

Figure 3. Collaborative Information Flow Model.

The collaborative information flow model is an ideal information transfer mode, and its core operation lies in information sharing. Yadav proposed that supply chain information sharing involves a series of information, such as inventory, demand forecast, production and distribution, and operating capacity levels of each enterprise in the supply chain. This information flows efficiently and is stored orderly, ensuring the sharing and exchange of information between supply chain enterprises, enabling a rapid response to demand uncertainty [10].

Although agricultural supply chain information sharing has many advantages, there are still factors that lead to poor information sharing. Firstly, management factors play a role. Due to the differing profitability, cultures, and strategies of the main enterprises in the agricultural supply chain, their management practices vary, leading to biases in information transfer. Secondly, technical factors contribute to the issue. The information processing methods and equipment used by node enterprises in the supply chain are not uniform, resulting in a lack of standardization and some obstruction in the flow of information. Finally, moral factors are at play, as agricultural supply chain node enterprises may misreport or conceal data for their own benefit, leading to information distortion and hindering information sharing.

In recent years, China's agricultural supply chain has developed rapidly, with some provinces, where agriculture is relatively advanced, establishing supply chain operation mechanisms centered around agricultural information platforms. This has significantly improved the efficiency of agricultural production and marketing. However, at present, the supply chain of agricultural products in Taiyuan City is still dominated by the traditional supply chain management mode-the wholesale market-centered supply chain

mode. Due to the spot trading mode and single logistics form, the information transmission in Taiyuan City's agricultural supply chain mostly follows a chain-type bidirectional flow. The interaction and decision-making are concentrated in adjacent nodes, leading to delayed information circulation and poor sharing between nodes. The interaction of information and decision-making are mainly concentrated in the neighbouring nodes, resulting in serious lag and distortion of information circulation, which greatly affects the efficiency of production and marketing of agricultural products in Taiyuan.

3.2. Agricultural Supply Chain Subject Contract Mechanism

According to the viewpoint of enterprise ecology, in order to ensure the healthy development of the enterprise ecosystem, the enterprise continuously generates the exchange of information flow, material flow and energy flow in the internal and external environment. The subject contract mechanism of the agricultural supply chain refers to the fact that under the premise of information exchange, in the process of internal and external exchange of information flow, material flow and energy flow, each subject in the agricultural supply chain is bound by the contract, evaluates and exchanges through coordination and control, and benefits each other, generates effects, and achieves supply chain equilibrium and win-win effects for each subject (Figure 4) [11]. As can be seen from the figure below, evaluation and feedback, as well as coordination and control are strong guarantees for the contract to carry out constraints. Overall, the subject contract mechanism throughout the formation and development of the supply chain, and the process of internal and external balanced exchange is the process of mechanism synergistic operation, the mechanism plays a role. When a subject in the supply chain violates the contract, the coordination and control of the whole supply chain will be seriously affected, and evaluation and feedback are difficult to achieve.

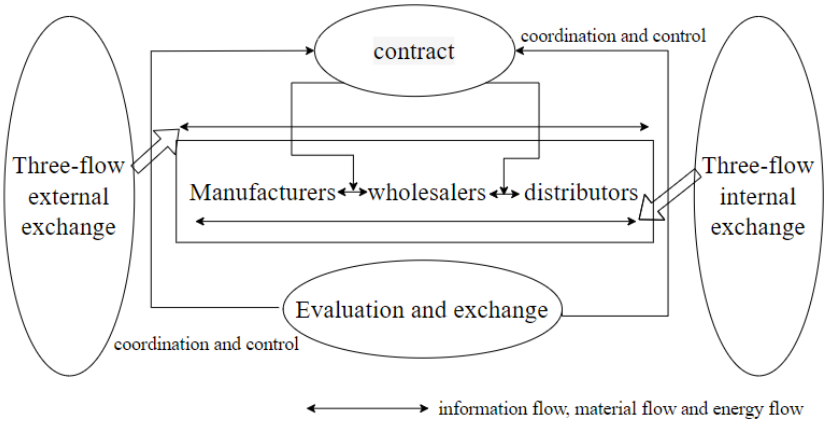

Figure 4. Subject Contract Mechanism.

Establishing the contract mechanism for agricultural supply chain subjects helps reduce transaction costs. Taiyuan City spans approximately 144 kilometers from east to west and 107 kilometers from north to south, covering a total area of 6,988 square kilometers. The region features complex and diverse topography, with an agroecology that exhibits a wide range of characteristics. In such a context, a stable contract mechanism reduces the coordination workload, thus significantly lowering costs. At the same time, establishing the contract mechanism enhances the agility of the agricultural supply chain. When the main bodies of the agricultural supply chain trust each other, active communication ensues, enhancing operational efficiency and increasing profits. Over time, this mutual trust strengthens the contractual relationships, enabling similar enterprises to learn from one another.

The agricultural supply chain involves a large number of node enterprises, with dispersed consumers and farmers at both ends, leading to complexity in its structure. Mutual communication and information sharing among complex entities greatly influence the reliability of trust and the goodwill of cooperation. Effective communication and information sharing enable supply chain entities to establish strong cooperative relationships, enhance operational efficiency, and reduce costs, all while adhering to the terms of the contract [12]. The lack of sensitivity to external information in Taiyuan City's agricultural supply chain leads to inadequate information inflow, causing slow reactions to emerging information, which in turn disrupts the operation of the contract mechanism. In the logistics and energy flow process within the supply chain, there is an unreasonable imbalance of interests. A large number of farmers provide raw products through hard labor, but they often receive relatively low returns, placing them at a disadvantage within the supply chain. At the storage and transport stage, the added value of logistics is greatly enhanced, resulting in higher final selling prices, but at the sales stage, which is dependent on the number of units sold, the profit per kilogram is small, resulting in low profitability. Under this situation, producers, storage and transport operators and sellers have an uneven distribution of profits, and when there is a conflict of interests, they often do not take into account the whole and do not implement the agreement, disrupting the normal operation of the market. The coordinated operation mechanism of the agricultural supply chain must adopt a variety of market and non-market instruments to ensure that the internal and external transactions of the "three streams" are balanced and that the regulatory mechanism operates efficiently.

3.3. Collaborative Operation Mechanism of Agricultural Supply Chain

The supply and price of agricultural products fluctuate significantly across seasons, making supply chain management challenging. The use of big data technology in agricultural supply chain management has led to more efficient information transmission. Additionally, the promotion of contract mechanisms among supply chain subjects is fostering a more synergistic operation of the supply chain. Supply chain synergy is driven by contractual collaboration between supply chain subjects. Through an information platform, it reorganizes the culture, resources, and functions of the enterprises, enabling the interaction of materials, capital, and information, thereby achieving a synergistic effect in supply chain management and enhancing overall competitiveness. The agricultural supply chain synergistic mechanism refers to the methods and approaches that strengthen connections between supply chain sub-systems, ultimately achieving the synergistic effect of the supply chain (Figure 5) [13]. Supply chain synergistic operation means that each element in the system must be organically integrated and collaborate to overcome traditional resource barriers, ultimately achieving a result greater than the sum of its parts.

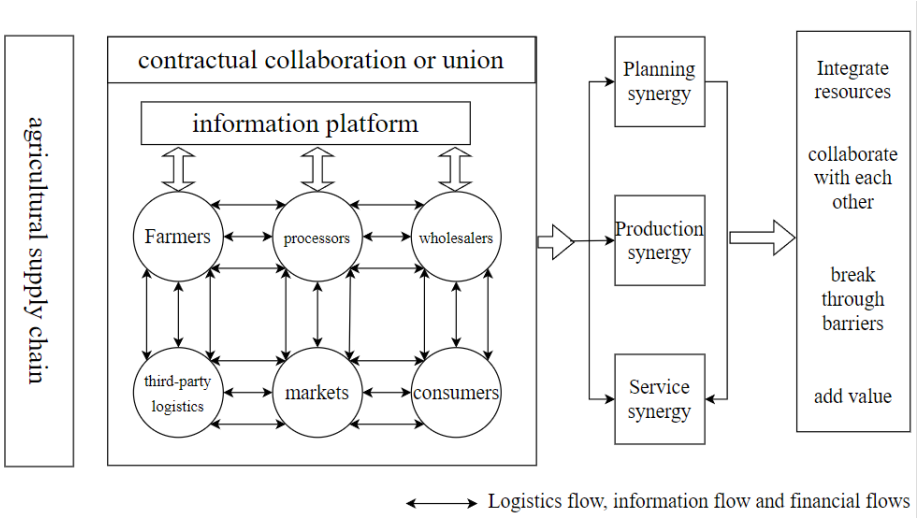

Figure 5. Collaborative Operation Mechanism.

With the growing market competition and technological changes, each subject in the agricultural supply chain is facing higher requirements and challenges. The increasing awareness of "cooperation" and "win-win" situations has also encouraged subjects in the supply chain to collaborate more actively; The continuous development of information technology and big data management tools, along with the reasonable distribution of benefits and risks, has greatly promoted supply chain collaboration. In addition to the above influencing factors, the transaction amount between supply chain subjects is also an important factor influencing the collaboration mechanism. When the transaction amount is small, the frequency of transactions increases, the scale of transactions decreases, and speculative opportunities are reduced due to lower returns per transaction. This, in turn, promotes collaboration within the supply chain.

The purpose of establishing the agricultural supply chain synergy mechanism is to effectively manage and utilize supply chain resources. Its value is mainly reflected in the following aspects [14]. First, planning synergy. The traditional supply chain planning is mainly for the data is discontinuous and non-real-time, in the prediction of demand accuracy is low. In the context of supply chain collaboration driven by big data, big data enables enterprises to analyze information more accurately and provide plans that align with actual strategies; second, production collaboration. Production is the core of the agricultural supply chain. In a collaborative supply chain, enterprises can achieve small-lot and personalized production by combining big data, internet technology, and cloud computing, better adapting to diverse consumer needs; third, service collaboration. Digital technology enables the overall upgrade and processing of the agricultural industry chain, enhancing the convenience, timeliness, and security of services while meeting the need for comprehensive synergy.

In terms of the overall supply chain of agricultural products in Taiyuan City, the synergy of the agricultural supply chain is at a low level, and the main circulation mode is still the "farmer-wholesale market-intermediary-retail market-consumer" mode [15]. The price of agricultural products due to the existence of multiple intermediaries and complex intermediate links, often appear repeatedly raise the price of the phenomenon, resulting in high additional costs in the logistics process, and low efficiency. The informationisation level of agricultural supply chain collaboration is still low, not forming a sound information network, making it difficult to effectively supervise branches and affecting the long-term development of the agricultural supply chain.

4. Optimization Measures for Supply Chain Operation of Agricultural Products in Taiyuan City

From the above analysis, it can be seen that the information transmission mode in Taiyuan's agricultural supply chain is still based on the traditional two-way information flow model, where information interaction mainly occurs between neighboring nodes. This leads to delays and distortions in the circulation of information. Additionally, there is a lack of an information-sharing platform to improve the efficiency of information transmission; Due to the low input of information and lack of sensitivity, the operation of the contract mechanism within the supply chain faces inefficiencies. This leads to unreasonable distribution of interests, which needs to be addressed. The phenomenon of irrationality needs to be improved; because the supply chain of agricultural products in Taiyuan City is still at a low level of coordination, the circulation mode is single, resulting in high added value in the logistics process, there is an operational risk, and there is a lack of reasonable planning of the transport network. Aiming at the above supply chain status quo, this paper puts forward the following optimisation suggestions.

4.1. Design of Information Sharing Platform for Agricultural Supply Chain Based on Big Data

Information sharing is essential for effective transmission in the supply chain. It enables supply chain members to share, gather, and manage relevant data on a common platform, thereby saving transaction costs, integrating resources, and maximizing overall profitability.

For the agricultural supply chain with lagging information transmission, the government should lead macro-planning while the main supply chain stakeholders actively participate in building an information-sharing platform. By leveraging existing technologies such as the Internet and big data, stakeholders can improve data management, establish a database center, and promote deeper collaboration. The information-sharing platform should be built on the basis of the information network system, that is, with the information flow as the core, to create a network of agricultural supply resources and distribution resources, and to assist the main bodies to jointly complete the whole process from the production to the sale of agricultural products [16]. Information shared includes basic information (e.g., agricultural production and demand data), tactical information (e.g., inventory and supply details from each trading enterprise), and strategic information (e.g., forecasting, product development, and marketing insights).

Setting up an agricultural supply chain information circulation platform can ensure smooth operation, facilitate information sharing, reduce uncertainty, and help stakeholders make optimal decisions, enhance profits, and strengthen business transactions. For the external agricultural supply chain, the platform can not only collect the internal and external information of each subject, when the external changes have a significant impact on the supply chain, each subject can react in time according to their own needs, respond to the market changes in a timely manner through the information platform, and safeguard the interests of each enterprise.

4.2. Strengthen the Coordination of Interests between the Main Bodies and Balance the Financial Risk of Supply Chain Operation

Efficient operation of the agricultural supply chain requires collaboration among its subjects. However, cooperation inevitably comes with risks, such as trust and financial risks. To solve the cooperation risk, it is necessary to strengthen the coordination of interests between subjects, balance the financial risk of supply chain operation, and mobilise the enthusiasm of enterprises to achieve a win-win situation under the premise of adhering to the contractual mechanism of the main body of agricultural products.

Building a balanced distribution system and establishing a fair mechanism for benefit sharing can effectively address the problem of uneven distribution within the agricultural

supply chain. Each enterprise should engage in full and equal consultation, clarify responsibilities, and, under the guidance of the government or industry organizations, reach a standardized cooperation agreement based on the law. Strictly enforce penalties for violating the agreement to regulate the market, share risks, and ensure win-win outcomes. In the distribution of profits of each enterprise, a reasonable performance evaluation can be established, based on the assumption of risk as the basis for a reasonable evaluation of the degree of contribution of each participating body, and then confirm the distribution of profits [17].

Agricultural supply chain subjects should adhere to the principles of reasonable choice and mutual benefit. When selecting partners, it is crucial to ensure mutual independence while maintaining close communication. By integrating resources and leveraging complementary advantages, partners can ensure efficient operation and enhance the overall competitive advantage. When distributing profits, the degree of risk sharing should be considered, with profit allocation based on the risks each subject bears, ensuring that all participants benefit.

4.3. Improve the Sales Network of Agricultural Products and Carry Out Risk Control of Logistics and Transport

Taiyuan Basin, with wheat, sorghum, beans and potatoes as the main food crops, and cotton, sugar beet, hemp, tobacco and rapeseed as the main cash crops, is one of the main crop production areas in Shanxi Province, which is a well-known throughout the country. However, multi-link transport, insufficient sales network and lagging information transmission are not conducive to benefit enhancement. Therefore, it is crucial to use big data to optimize the agricultural supply chain sales network in Taiyuan and mitigate logistics and transportation risks.

To improve the sales network of agricultural products, it is crucial to streamline the circulation process and actively develop e-commerce. The rapid development of e-commerce has brought a huge impact on various industries, and it is also a major change in the circulation of agricultural products. Producers and processors of agricultural products should seize the opportunity to open new sales channels through platforms like Taobao, Jingdong, Netease Yanxuan, or live streaming platforms such as Douyin and Kuaishou [18]. Through e-commerce, agricultural products can be showcased, circulation channels shortened, costs reduced, and production made more efficient.

Smooth circulation of agricultural products across regions must be based on market and consumer demand, which sets higher requirements for the construction of the agricultural logistics system. In recent years, logistics technology in Taiyuan City has developed significantly, but there is still a gap in the standardization of logistics technology. The relevant agricultural products industry or organizations in Taiyuan City can improve the modern cold chain transport system of agricultural products logistics with the help of agricultural products information platform on the basis of increasing hardware investment, which can effectively reduce the risk of agricultural products supply chain logistics and promote the development of cold chain logistics in the direction of standardization, intelligence and specialization [19].

5. Conclusion

In summary, although the agricultural supply chain and its operation in Taiyuan City is booming, with mutual cooperation among the subjects and the use of big data technology to optimize information management, there are still some problems, which are detrimental to the overall improvement of the agricultural supply chain. Under the traditional agricultural supply chain model, there are more intermediate links, higher costs, and narrower production and sales coverage, which is not conducive to the expansion of enterprises and at the same time reduces the production enthusiasm of farmers. The optimisation of the agricultural supply chain in Taiyuan still has a long way to go and requires the

joint efforts of the government, industry organizations and relevant agricultural enterprises. In terms of information management, the advent of the big data era provides an opportunity for the development of agricultural supply chain, and relevant enterprises should build an information platform based on big data to improve the efficiency of information management. In terms of subject co-operation, all subjects in the agricultural supply chain in Taiyuan City should coordinate with each other in terms of interests and balance the financial risks of supply chain operation. In terms of agricultural product sales, enterprises should focus on sales network improvement and control logistics and transport risks.

The reshaping and rebirth of the agricultural supply chain in Taiyuan City in the era of big data is a great opportunity, which will effectively solve the many problems existing in the current agricultural supply chain, improve its existing operation and management situation, and strengthen the construction of agricultural supply chain. It is believed that under the implementation of relevant measures, the supply chain of agricultural products in Taiyuan City will become more and more intelligent, informative and data-driven, so as to realise the good quality and low price of agricultural products, increase the income of farmers and enterprises, and satisfy the consumers in shopping.

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