Research on Enterprise Trust Relationship of Jilin Province Agricultural Products Supply Chain Based on Big Data Blockchain Logistics

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Abstract. Relationship and trust are essential factors to aggregate the agricultural product supply chain's central bodies and maintain the agricultural product supply chain's dynamic flexibility. Especially for the agricultural product supply chain dominated by e-commerce with many atomic farmers, relationships and trust are even more critical. The basic premise to ensure its effective operation. Big data blockchain has high security, distributed storage, publicity mechanism, anonymity, openness, transparency, etc. It is of great significance to apply it to the supply chain of agricultural products. Based on the analysis of the significant data blockchain logistics and the relationship between big data and the supply chain, this article discusses the construction and coordinated decision-making of the big data-based supply chain of agricultural products in Jilin Province provides references for relevant personnel.

1. Introduction
In recent years, my country's food and agricultural product quality and safety problems have continued to occur, seriously affecting consumers' health. Strengthening the quality and safety management of agricultural products and ensuring the quality and safety of agricultural products from the field to the table has become many consumers' voices. In this case, the agricultural product supply chain comprises farmers (agricultural producers), producers (agricultural products purchasing and processing enterprises), wholesalers, retailers, and final consumers from the field to the table. The agricultural product supply chain constitutes the quality of agricultural products. The role of control has received more and more attention.

As a central agricultural province in my country, Jilin Province is rich in natural resources. Especially in recent years, the agricultural product processing industry has achieved considerable development and has become a vital advantage industry and pillar industry in the industrial layout of Jilin Province. The agricultural product processing industry cluster is becoming more and more mature. The construction and development of various industrial parks and processing bases have increasingly become the focus of the government, enterprises, and all walks of life. The growth trend of the total output value is noticeable, and the growth rate is increasing year by year. Based on double-digit growth for many years, Jilin Province's agricultural product processing industry's sales revenue reached 520 billion yuan in 2016, an increase of 7.5%. The province's agricultural product processing enterprises have grown to more than 6,500, of which 47 are national-level leading enterprises. There are 521 provincial-level leading
enterprises, 229 enterprises with sales revenue exceeding 100 million yuan, 18 enterprises above 1 billion yuan, and 4 enterprises above 10 billion yuan. The full scale continues to expand. Continuously promoting the improvement of agricultural industrialization and informatization in Jilin Province and realizing the healthy and rapid development of the agricultural product processing industry is a meaningful way to promote the strategic adjustment of agriculture and rural economic structure. Compared with the traditional manufacturing industry, the agricultural product processing industry has a longer growth cycle, and the quality of agricultural products is easily affected by various natural environments and is easy to corrode and not easy to preserve [1]. At the same time, although the agricultural product supply chain model dominated by e-commerce in my country is in a blue ocean pattern at this stage, it is also faced with large gaps in strength and status among supply chain subjects, information asymmetry, lack of trust, and random and loose connections between nodes. Problems such as low efficiency of supply chain operations. Therefore, relationship and trust, as an essential factor to aggregate the central bodies of the agricultural product supply chain and maintain the dynamic flexibility of the agricultural product supply chain, are the fundamental source of value-added in the agricultural product supply chain, especially for the e-commerce-led agricultural products that have many atomic farmers. In terms of the supply chain, relationship and trust are the necessary prerequisites to ensure its effective operation.

2. The concept of blockchain
The regional chain comes from Bitcoin, which is also a digital currency. Many large banks in the world have begun various forms of blockchain-related exploration. And at present, this technology has received a lot of domestic attention. In January 2016, my country's People's Bank of China had already proposed to strive to launch a digital currency issued by the central bank. Based on this, it can be seen that based on blockchain, the supply chain of agricultural products can realize financial services through digital currency in payment. When the blockchain forms Bitcoin, the blockchain is only a storage unit, which mainly records all the information exchanged in all blockchain stages within a certain period. As shown in Figure 1, it describes how to use random hashing (Hash algorithm) in each block to realize the connection. The following block mainly contains the hash value of the previous block. In the later period, the continuous promotion of the increasing expansion of information exchange prompted one block to connect to another block one after another, thus forming a blockchain [2].

![Connection diagram within the block.](image-url)
3. The connotation of cooperation and trust in the nodes of the agricultural product supply chain in Jilin Province

The agricultural product supply chain is a vertical network organization system organized and led by core enterprises connected by agricultural material suppliers, agricultural product producers, processing companies, distributors, and consumers. Relationship and trust are the foundation of the cooperative relationship in the agricultural product supply chain. Without trust, cooperation can neither be formed nor maintained. With the deepening of cooperation, the node cooperation relationship will become closer. Trust is the core to realize the collective innovation of cooperative enterprises [3]. Only when the supply chain has a strong cooperative trust relationship can it form a strong cooperative innovation capability and effectively improve supply chain operational efficiency. However, once the trust between nodes is lost, their relationship will gradually become alienated, and the supply chain will also be broken.

The contractual exchange relationship between the agricultural product supply chain nodes is different from a one-off market transaction relationship in the full sense. It is also different from a vertically integrated transaction relationship under an enterprise's internal instructions under the same property rights. The degree of risk-taking is divided into a market contractual relationship, contractual production relationship, and horizontally integrated strategic partnership from weak to strong. There is a close division of labor between the agricultural product supply chain's leading bodies as an institutional arrangement for co-creating value. This division of labor connects parties with different specific assets [4]. This kind of economic exchange relationship is a prerequisite for ensuring cooperation. The long-term interaction of cooperation to create value can form the social exchange relationship between supply chain nodes, which originates from the repeated and continuous economic exchange relationship between the participating parties based on fulfilling the contract. All parties involved in the agricultural product supply chain have realized and re-understood the ever-expanding information transmission and communication. This understanding and re-understanding include all previous transaction processes, experience accumulation, social network background, and expectations for future transactions between nodes. And any transaction is based on considering the counterpart's past transaction experience and upcoming transaction expectations. This kind of knowledge and re-understanding can continuously deepened can promote emotion and trust among node members. This kind of trust enables cooperative enterprises to share information, knowledge, technology, resources, and collaborative innovation in the entire agricultural product supply chain network to a higher degree beyond economic relations and promote the formation of shared values and relationship norms, thereby significantly improving the supply of agricultural products Chain efficiency. Therefore, the exchange between the nodes of the agricultural product supply chain is an economic exchange relationship based on contractual contracts and a social exchange relationship based on emotion and interaction [5]. The benefits of supply chain cooperation result from the combined effect of economic exchange relationships and social exchange relationships.

4. A theoretical basis for establishing a trust mechanism for agricultural supply chain partners

First, establish a trust mechanism for partners in the agricultural product supply chain based on repeated games' cooperation principle. This paper establishes a simple game analysis model for partners in the agricultural product supply chain. Suppose the game is unfolding between A and B on the node of the agricultural product supply chain. Two companies each have two strategies-trust each other or distrust each other. To simplify the model, assuming that the two parties trust each other to the same degree, the cooperation can bring benefits to each of the five units; when one party trusts the other party that is not trustworthy, its trust will be used by the other party, so the trusted party will suffer five For the loss of the unit, the other party gets 10 units of gains due to opportunistic behavior; when the two parties do not trust each other, there is no possibility of cooperation, the game ends, the gains of both parties are 0, and the uniform distance is like Table 1 shows. In the table, the former is the game gains of enterprise A, and the latter is the game gains of enterprise B (negative numbers represent losses). So, should A trust B?
Table 1. Game analysis model.

|       | trust  | Distrust |
|-------|--------|----------|
| trust | 5, 5   | -5, 10   |
| Distrust | 10, -5 | 0, 0     |

It can be seen from Table 1 that if the game is only played once, the standard answer is clear. If A once trusts B, B's final choice is to deceive, and the 10 obtained by B deception is greater than the 5 obtained by honesty. If A does not trust B, then B's final choice is also not to trust. Because B trusts A and loses 5, but if he doesn't trust A, he won't cooperate, and there is no loss. Therefore, only one game is played, and there is only one equilibrium at that time: (distrust, distrust), so the cooperation between the two parties will not succeed. And mutual trust will make every enterprise get 5, making the entire agricultural product supply chain a Pareto optimal. The competition between enterprises is no longer the competition between individual enterprises, but the competition between the entire agricultural product supply chain. Although (distrust, distrust) is the best choice for a single company (trust, trust) enables both parties All benefit and achieve "win-win," which is optimal for the entire agricultural product supply chain [6].

Second, establish a trust mechanism for partners in the agricultural product supply chain based on the behavioral process generation mechanism's principles. The continuity and experience of human behavior are the basis for trust establishment. The continuity of behavior determines that past behavior has an indelible impact on current and future behavior. Therefore, long-term continuous, and reliable mutual relationships will be further transformed into mutual trust. And dependence. And once the further development of the cooperation between the parties and their mutual relationship can bring more generous benefits, mutual trust will follow. The same is true for cooperative partnerships in the agricultural product supply chain. With the continuity of behavior between partners and the continuity and expansion of interests, the cooperative relationship will continue to develop and become stronger.

5. Resume the credit system of Jilin Province agricultural product supply chain under the big data blockchain

According to the basic architecture of the blockchain application, combined with the supply chain management business process, this article implements a blockchain-based supply chain management platform, and its system structure is shown in Figure 2.

![Figure 2. Supply chain management platform based on blockchain.](image)
The system writes business logic into the blockchain in the form of smart contracts. Wholesalers, retailers, and consumers at all levels, as familiar participants in the blockchain, can access the blockchain through online platforms or other distributed applications. Network, get information on the chain. Besides, for supply chain management, the system has enhanced the access mechanism and authority control based on the traditional blockchain alliance chain and subdivided the blockchain nodes into ordinary nodes, functional nodes, and storage nodes [7]. Different nodes correspond to different supply chain roles and have different operation permissions on blockchain information according to their functional differences. See Table 2 for details.

Table 2. Function details of each node.

| name          | Information operation authority on the chain | Corresponding supply chain role                                      | Whether to store data |
|---------------|--------------------------------------------|---------------------------------------------------------------------|-----------------------|
| Normal node   | read                                       | consumer group                                                     | no                    |
| Title node    | Partial data read and write                | Third-party companies other than core companies                     | Part of the data stored on the chain |
| Full node     | Read and write all data                    | Core enterprise or authorized user of core enterprise                | All data stored on the chain |

The division of nodes by function saves the storage cost of ordinary nodes and functional nodes and reduces the extra cost of the entire system; on the other hand, it standardizes the read and write permissions of each node, avoids the leakage of confidential information, and improves supply the confidentiality and security of the chain.

6. Conclusion

If my country's agricultural product supply chain wants to develop, there must be modern distributors, supermarket systems, logistics distribution, transportation, information, warehousing, and other professional enterprises. Improving market-oriented enterprise organizations and the integration of agricultural enterprises and supply chains will help these enterprises "survive together" in the "baptism" of market competition, avoid "joint elimination," and have an advantageous position in market competition. Simultaneously, it is necessary to further improve the effective trust mechanism and the fair distribution mechanism of benefits for agricultural, industrial clusters, and agricultural product supply chains. To ensure the fairness of the distribution of benefits among the nodes of the agricultural product supply chain, the benefit distribution mechanism should follow the following basic principles: the principle of benefit sharing, risk-related principles, and investment-related principles, participation constraints, and continuous communication. This article gives the basic framework of blockchain application, realizes a blockchain-based supply chain management system, effectively opens up the information flow of procurement, production, logistics, sales, and supervision, and provides a complete supply chain management plan. In the future, blockchain technology will inevitably be combined with more real economies, accelerate the transformation and upgrading of traditional industries, and provide new momentum for developing traditional industries.

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