Research on the Trust Relationship of Jilin Province Agricultural Products Supply Chain Enterprises Based on the Theory of Green Environmental Protection Block chain

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Abstract. The successful advancement of the Internet + agriculture strategy in Jilin Province has accelerated the circulation efficiency of agricultural products in Jilin Province, and played a vital role in increasing the income of farmers and encouraging their enthusiasm for planting. Under the background of green environmental protection and low-carbon economy, the block chain technology solves the problems of inefficient information transmission in the supply chain led by core enterprises, low matching of information traceability requirements and capacity status, and endless information islands. Combined with block chain technology, analysis there are problems in the information optimization of the agricultural product supply chain in Jilin Province. The "block chain + agricultural product supply chain" is used to realize the model of decentralization, information sharing, and in-depth cooperation mechanism, so as to realize the coordination of the agricultural product supply chain and effectively improve the agricultural product. The value-added process of the supply chain has established a three-party trust model for the government, core enterprises and consumers in the process of building a green agricultural supply chain.

Keywords: Green environmental protection, blockchain, agricultural products in Jilin Province, agricultural product supply chain, corporate trust.

1. Introduction
As the concept of "low-carbon economy" continues to be known to people, and at the same time, in the context of global warming posing a serious threat to the sustainable development of the human economy and society, the current green environment centered on protecting the environment and saving resources the revolution is quietly rising around the world. Green supply chain management is just such an emerging modern management model. It comprehensively considers environmental factors and resource utilization in the entire supply chain, and integrates "green" and "environmental protection" into it to achieve the goal of green manufacturing.

Since the first development of block chain technology, it has already developed into the current 3.0 era. The upgrading of technology has created a new perspective for the optimization of agricultural product supply chain information. Integrating key technologies in the block chain into the agricultural product supply chain will be a milestone in the history of agricultural development. Trust, cooperation,
and sharing of benefits and risks among supply chain members are the keys to the success of the agricultural product supply chain. At present, the production and management of agricultural products in my country is scattered, and the number of individuals involved is large [1]. In pursuit of maximizing their own interests, the organization and cooperation relationship between agricultural product producers and operators is loose, with little exchanges and low trust. For the agricultural product supply chain to have great development, it is necessary to establish and improve the trust mechanism among supply chain members such as suppliers, manufacturers, supermarkets, etc., to reduce or even eliminate the possibility of members gaining benefits through deception, and to maintain cooperation between members. Thereby reducing the total cost of the supply chain and improving the overall performance of the supply chain. This article will analyse from the perspective of block chain technology and deeply integrate the specific mode of agricultural product supply chain information management. The purpose is to better improve the needs of network nodes, promote the information co-integration of each node of the supply chain network, and accelerate the efficiency of information transmission. Make the agricultural product supply chain achieve global optimization. This will have far-reaching significance whether it is the practice of supply chain management or the study of the basic theoretical system of supply chain management.

2. Overview of the agricultural product supply chain
Combining the understanding of domestic and foreign experts and scholars, the agricultural product supply chain we are discussing refers to agricultural products as the object, consisting of agricultural production material suppliers, farmers (agricultural products producers), agricultural product processing companies, distribution companies, retailers and logistics distribution industry Functional network chain system formed by upstream and downstream enterprises. It is a market-oriented, consumer demand-centered strategic alliance composed of enterprises in all links of the chain. In essence, the agricultural product supply chain is not only a product material chain connecting suppliers, producers to customers, but also a value-added chain that increases the value of agricultural products in the supply chain due to processes such as processing, packaging, and transportation. In the construction of each type of agricultural product supply chain, there is always an enterprise or a type of enterprise (producer, supplier, seller or intermediary organization) that is the leading force in the operation of the supply chain, and they have an impact on all links of the supply chain maximum [2]. This dominant force is the core enterprise in the supply chain. The core enterprise in the agricultural product supply chain can be an agricultural product processing enterprise, a purchasing and marketing enterprise or a retail enterprise.

3. The application of block chain in the supply chain of agricultural products in Jilin Province under the concept of green environmental protection
Jilin Province is a large agricultural province. At present, block chain technology has begun to be applied in many areas of the real economy. The characteristics of block chain, such as distributed, non-tamperable, and traceable, have been extensively explored and achieved initial results in the transformation of the real economy. The model and logic of the block chain in the real economy industry scene have become increasingly clear [3]. Use block chain for agricultural product supply chain management to realize information sharing and integration, and appropriately optimize the structure and process of the supply chain. With the support of block chain technology, a network information platform is established to connect farmers, enterprises and retail terminals to realize real-time tracking and full-process management of agricultural product logistics links, and strengthen information chain management, thereby greatly reducing trust and management costs. Secondly, under the technical background of block chain, the information sharing of the agricultural product supply chain is realized, transparency is improved, the traceability control of the logistics process is realized, and the quality and safety of agricultural products are guaranteed. At the same time, farmers can also predict market demand based on information analysis to avoid information inconsistencies. Symmetry phenomenon.

Based on the traceability mechanism of block chain technology, the entire process of agricultural product planting, production, processing, packaging, transportation and sales is traced. Real-name
authentication is also performed on enterprises and users. Once fraud or counterfeit goods are discovered, law enforcement agencies can directly locate, obtain evidence, and hold accountable. The dissertation introduces decentralized technology to eliminate central management and control. Through distributed accounting and storage technology, the self-management of enterprise information at each node can be completed. Since then, the information resources in the network no longer need to be led by the core enterprise. All participating nodes can exchange and save information equally, and use the same rights and obligations with each other. On this basis, the optimization of supply chain information resources can be better realized. (As shown in Figure 1). Combined with block chain technology, the information database is optimized to make information communication smooth and improve the efficiency of the network. Multiple and timely information transmission helps eliminate the bullwhip effect. The value creation of information has been significantly improved, not only can quickly respond to consumer needs, but also better promote the development of agriculture.

Figure 1. The integration of block chain and agricultural product supply chain information resources

In the above-mentioned solution to the problem of information sharing, the consensus mechanism formed by the distributed nodes in the block chain system enables each zone to form a "chain" that can store data forever and can continue indefinitely. In a block chain composed of a hash algorithm, the powerful storage capacity can permanently store the data information generated by each node in the agricultural product supply chain network, and has the characteristics of tamper-proof and traceability [4]. By introducing consensus mechanism technology, it can not only handle a large number of cumbersome activities between network nodes, but also avoid additional opportunity costs between network nodes due to insufficient trust. The immutable timestamp effectively maintains the authenticity of the information and data, and the immutable data strips engrave a unique imprint on the transaction information that occurs on the entire network, which provides a new idea for information anti-counterfeiting and data tracking (such as Figure 2 shows).
4. Enterprise trust relationship in agricultural product supply chain in Jilin Province

4.1. The trust game analysis of agricultural product supply chain based on Nash equilibrium theory

The game behaviour of agricultural product supply chain enterprises in the process of cooperation can be divided into trust and distrust. Trust refers to the fact that the game party is fully in accordance with the relevant agreements that have been signed, and fully believes the other party's performance in the future cooperation. This choice can maximize the benefits. Distrust refers to the fact that one party of the game doubts the other party's willingness and behaviour to fulfil the agreement, thereby breaking the contract and interrupting the supply chain [5].

According to game theory, we take the agricultural product supply chain in the form of "company + farmer" as an example, and use farmer and processing enterprise as the analysis object to conduct game analysis. Assuming that farmers and processing companies are the two sides of the game, the game between them is divided into trust and distrust. The returns of these two strategies are shown in Table 1. It can be seen from Table 1 that the ideal choice for both parties should be to choose to trust each other. At this time, both parties obtain 8 benefits, but both parties are caught in a "prisoner's dilemma" based on their own interests. That is to say, for farmers, if the processing enterprise adopts a trust attitude in cooperation, the benefits obtained by the farmers will be 8 and 12 respectively. According to the principle of maximizing benefits, the farmers will choose a strategy with a benefit of 12, that is, they do not trust the other party; Adopting a distrust attitude, then the benefits obtained by the farmers are 2 and 4 respectively. Similarly, in accordance with the principle of maximizing benefits, the farmers will choose the strategy of 4, that is, they do not trust the other party. Therefore, no matter what strategy the processing enterprise chooses, the rational choice of farmers is a strategy of not trusting each other. In the same way, processing companies will also choose the strategy of not trusting each other. Therefore, the Nash equilibrium solution of the game is (distrust, distrust).

Table 1. Game matrix of trust selection in agricultural product supply chain companies

| Farmer | Processing Enterprise | trust   | Distrust |
|--------|----------------------|---------|----------|
| trust  | (8, 8)               | (2, 12) |          |
| Distrust| (12, 2)             | (4, 4)  |          |
The profit of an enterprise depends not only on its own behavior, but also on the behavior of another enterprise with which it trades. It is worth noting that in the process of cooperation between enterprises in the agricultural product supply chain, the core enterprise’s choice of node enterprises is a one-time static game, and the process of maintaining the cooperative relationship between agricultural supply chain enterprises is often repeated. Game, the following is a brief analysis of repeated games.

4.2. The trust game analysis of maintaining the cooperative relationship between enterprises in the agricultural product supply chain

The trust game in the process of agricultural supply chain cooperation is the result of a long-term dynamic game. For the convenience of analysis, we assume that both sides of the game are equal in power [6]. After the formation of the agricultural product supply chain, non-trust behavior will unilaterally obtain a certain benefit A for the breaching party. At the same time, the other party will suffer a certain loss B. If both parties of this game matrix choose to trust and maintain a cooperative relationship, the result of the game is that both parties benefit from X. When the agricultural product supply chain collapses, both parties can only get the income of C, C<X, where X+A>C>X-B. Thus, the game matrix is established as shown in Table 2.

### Table 2. The trust game matrix in the process of agricultural supply chain cooperation

| Party B | trust | Distrust |
|---------|-------|----------|
| trust   | (X, X) | (X-B, X+A) |
| Distrust| (X+A, X-B) | (C, C) |

When the probability x that the government supervises the green supply chain of agricultural products and the probability z that consumers participate in the supply chain are given, suppose that the income obtained by the enterprise adopting the "implementation" strategy is \( u_{ey} \), and the income obtained by adopting the "non-implementation" strategy is \( u_{en} \), then Have

\[
u_{ey} = y(R_1 + S_1 - C_2 - C_3)x + (S_1 - C_2)x(1-z) \tag{1}\]

\[
u_{en} = (1-y)(1-P_1)x + (R_2 - P_2)(1-z)x + (S_1 - C_2)x(1-z) \tag{2}\]

When the expected benefits obtained by the two strategies are the same, the game equilibrium state can be reached. Let \( u_{ey} = u_{en} \),

\[
y^* = \frac{R_2(1-z) - P_1x}{(S_1 - P_1)x + (R_1 - R_2 - C_3)z + R_2 - C_2} \tag{3}\]

The process of cooperation between the core enterprises of the supply chain and the partner enterprises is a process of repetitive game. The supply chain with balanced partners' strength often has turbulence, which is mainly the result of the entire chain's ineffective prevention of opportunism. In the unequal supply chain between core enterprises and partners, although partners receive less benefits than core companies and are restricted by them, their choice of cooperation will increase the benefits than independent development, and the cost of default is huge. Therefore, the supply chain partnership with core enterprises is the most stable supply chain.
5. Conclusion
In the process of information optimization, block chain technology is integrated, and it is hoped that the information platform built by block chain technology will achieve global optimization and achieve the perfect combination between block chain and supply chain. Under the concept of environmental protection and green economy, the role of core enterprises is crucial in the establishment and operation of the trust mechanism of the agricultural product supply chain in Jilin Province. This is because the core enterprise has a relatively strong position in the supply chain, and it has greater restraint and restriction on other members. Therefore, the makers and supervisors of the trust mechanism should be based on core enterprises, but in the process of mechanism formulation, members should participate as much as possible in a democratic and open manner, so that the formulation of the mechanism is more group decision-making, while taking into account all aspects. Aspect interests. On the other hand, it is necessary to entrust external agencies of the supply chain to supervise and constrain the behaviour of core enterprises to ensure the effective operation of the mechanism so that other member enterprises will not be harmed due to their disadvantaged position.

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