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The Application of Blockchain in Agricultural Supply Chain Finance--The Case of Hecheng Rural Commercial Bank

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Abstract: *With the promotion of China's policies to benefit and enrich agriculture and the construction of rural information technology, the cause of rural revitalization has made remarkable progress. Rural financial infrastructure is becoming increasingly perfect, and convenient financial services are playing an important role in the development of inclusive finance. The state advocates that financial institutions use cutting-edge technologies such as blockchain and agricultural supply chain finance to innovate rural financial services. Despite the expansion of rural financial coverage, problems such as an imperfect rural financial system, a weak credit environment foundation, high loan risks, and a single product category are still involved. Hecheng Rural Commercial Bank utilizes the "Blockchain" + "Agricultural Supply Chain Finance" model, based on the "Fengshou Interconnected APP" and "Fengshou Stage", to open up the "last kilometer" of financial services, and to promote the development of other financial institutions. It provides a reference for the development of other financial institutions, and suggests that financial institutions should combine high-tech means to strengthen rural financial services, build a perfect rural financial market system, and realize the goal of facilitating the people and enriching the farmers.*

Keywords: *rural revitalization, blockchain, agricultural supply chain finance, facilitate the people and enrich the farmers, financial innovation.*

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I. Introduction

Agricultural supply chain management is an important part of agricultural development, how to build a perfect and efficient agricultural supply chain system is of great significance to promote the modernization of China's agricultural market. Agricultural supply chain finance is a financial model that provides financing and other services to relevant enterprises and farmers in the supply chain. (Miao and Jiang, 2021)[1] The model is based on the agricultural supply chain, led by the core enterprise, effectively integrating the logistics, information flow and capital flow in the supply chain, and effectively linking the information involved in the supply of production materials, production of agricultural products, logistics and transportation, distribution and consumption of agricultural products, to boost the operational efficiency of the traditional agricultural supply chain, and injecting new vitality into the development of agriculture. (Wang and Wen, 2021) [2].

In 2017, the Guiding Opinions on Actively Promoting Supply Chain Innovation and Application issued by the General Office of the State Council proposed to study the use of blockchain and other emerging technologies to establish a credit evaluation mechanism based on the supply chain. 2020 Central Document No. 1 also made it clear that it is necessary to accelerate the application of blockchain and other modern information technologies in the field of agriculture. Under this trend, Hecheng Rural Commercial Bank follows the trend of technology-enabled finance, combines "blockchain" and "agricultural supply chain finance", and innovatively launches the "Fengshou Interconnected APP" and "Fengshou Stage" to realize the convenience of the people and enrich the farmers, and boost the development of rural financial business. Based on the "Fengshou Interconnected APP" and "Fengshou Stage" of Hecheng Rural Commercial Bank, this paper explores the technological advantages of blockchain and explores the basic principles and applications of blockchain to empower agricultural supply chain finance, intending to provide experience for the development of agricultural supply chain finance by rural financial institutions.

II. Relevant overview of blockchain technology

(i) The basic connotation of blockchain

Blockchain relies on distributed data storage, decentralized data transmission, and cryptographic algorithms to connect blocks in a chain structure to form a distributed shared ledger (Lu et al., 2021)[3]. In this

ledger, a consensus algorithm determines the bookkeeper, cryptographic signatures and hash algorithms ensure that transactions are tamper-proof, and timestamps and hash functions ensure that links between blocks are tamper-proof. (Xia and Zhao, 2020) [4]

(ii) Architecture model of blockchain

Based on the main applications of blockchain technology, this paper describes it with a system of six layering and the connotation of its layers is shown in Table 1 below.

Table 1 Blockchain application system layering table

Blockchain architecture model	connotations	key technologies
Application layer	Transferring money, bookkeeping, building credit rating systems or other applications	Digital Currency
Contract Layer	Automated Scripting Code for Smart Contracts	Smart Contracts
Incentive Layer	Incentive mechanisms strongly associated with consensus mechanisms	Issuance mechanism, distribution mechanism
Consensus Layer	Encapsulates various types of consensus algorithms for network nodes	PoW/PoS/DPoS/Pool/PBEF
Network Layer	Data dissemination and authentication mechanisms based on P2P networking	Peer-to-peer network technology
Data Layer	Chain-structured data blocks	Asymmetric encryption algorithms, database techniques, Merkel trees, hash algorithms, timestamping techniques

III. Application Scenarios of Blockchain in Agricultural Supply Chain Finance

Hecheng Rural Commercial Bank applies blockchain technology to agricultural supply chain finance, and innovatively launches online "Fengshou Interconnected APP" and offline "Fengshou Stage" to meet the financing needs of farmers. "Fengshou Interconnected APP" uses blockchain technology to empower credit assessment and agricultural loans, and launches "Fengshou Loan" to meet the financing needs of farmers; it empowers the sale of agricultural products, and helps farmers sell slow-selling agricultural products through "Internet +Adoption of Agricultural Products"; and it empowers the medical care of farmers. In addition, the company has set up a "cloud medical" system to provide farmers with convenient access to medical services. As a convenient financial service point of Hecheng Rural Commercial Bank, "Fengshou Stage" receives and handles the basic business of ordinary branches, and at the same time, it also undertakes the convenient services of "Fengshou Interconnected APP" extended to the offline.

(i) Empowering Credit Assessment

Hecheng Rural Commercial Bank uses blockchain technology to build a new type of credit union, and the credit assessment platform uses the credit technology provided by the blockchain architecture to penetrate the multi-layer transaction structure to remotely grant credit to farmers. Hecheng Rural Commercial Bank imports its customer information and historical transaction data into the credit assessment platform in "Fengshou Interconnected APP", and uses the distributed ledger technology of blockchain to build a multi-node transaction relationship, to carry out distributed recording and storing of information and realize information interaction. The information is then screened and filtered with the help of internet technology to avoid the interference of useless information. Simultaneously, smart contract technology is used to establish credit rating rules and record the corresponding credit score to help complete the identification and assessment of risk and build a user credit profile. Finally, the use of encryption algorithms and consensus mechanisms enables the blockchain system to have the characteristics of consistent data storage and tampering, so that the data can be transmitted in a true and low-cost manner to eliminate information asymmetry, thereby effectively reducing its risk control costs and loan default rate.

(ii) Empowering agricultural loans

Hecheng Rural Commercial Bank uses blockchain technology to empower agricultural lending and innovatively launched the "Fengshou Loan" platform on the "Fengshou Interconnected APP". The platform makes use of blockchain technology to connect farmers, rural cooperatives and "Fengshou Interconnected APP" in agricultural supply chain finance, forming a closed loop of information. Through the distributed ledger technology of blockchain, the credit rating and asset assessment data of farmers are stored in the library, and the data are guaranteed to be true, effective and tamper-proof. Then, combined with the user credit portrait provided by the credit assessment platform, the credit rating of farmers is transmitted to the participants of the whole chain to achieve the visualization of the transactions of all nodes of the whole chain, and to ensure that the whole chain

agrees to the rules of credit rating to build a new type of credit union. Finally, the blockchain smart contract technology is used in combination with the agricultural produce yield assessment technology to assess the yield of agricultural products that are not yet matured by farmers, and formulate a loan amount for farmers that is in line with their reality.

(iii) Empowering Agricultural Product Sales

Hecheng Rural Commercial Bank uses blockchain technology to empower the sale of agricultural products and has innovatively launched the "Fengshou Farm" to meet consumer demand for high-quality agricultural products, which allows consumers to monitor the growth of the agricultural products they have adopted in real-time through the "Fengshou Interconnected APP". To ensure the quality of the agricultural products adopted by consumers, Hecheng Rural Commercial Bank actively cooperates with farmers to upload the camera data of agricultural products in real-time to the database, which applies AR and VR technologies to transmit the data to the page of "Fengshou Farm" in 3D form for consumers to view in real-time. At the same time, Hecheng Rural Commercial Bank will analyze the data uploaded to the database using big data analysis technology to predict and evaluate the yield of agricultural products, and then put the results into the blockchain and record the information using its distributed ledger technology to ensure that consumers will not receive agricultural products that are lacking in weight or quantity. It also actively co-operates with logistics companies to help transport the agricultural products subscribed by consumers to designated addresses or pick them up at offline pick-up points set up by "Fengshou Stage" after they have matured.

(iv) Empowering farmer' healthcare

Hecheng Rural Commercial Bank uses blockchain technology to empower farmers' healthcare, relying on the Internet to transform traditional healthcare, and innovatively launching the "Cloud Healthcare" model to open up online and offline diagnosis and treatment services, and enhance the efficiency of patients' medical treatment. Users can make cloud consultations, cloud registration and cloud payment through the "cloud medical" system, realizing the cloud medical mode without leaving home, and their medical records will be uploaded to the "cloud medical" system and eventually stored in the database of Hecheng Rural Commercial Bank. Based on the database, "Cloud Medical" establishes a big data analysis and decision-making mechanism, conducts personalized analysis of users' medical information and provides suggestions, realizing data-based scientific decision-making and making intelligent medical care accurate and convenient for the people. Simultaneously, the system also uses blockchain technology to encrypt the information in the database to improve data security.

Ⅳ. Conclusion

This paper discusses the innovative practice of Hecheng Rural Commercial Bank in the field of "Blockchain"+ "Agricultural Supply Chain Finance", and concludes the suggestions for the future development of financial institutions. First, blockchain technology can improve the risk control ability of financial institutions and significantly reduce the rate of non-performing loans. Financial institutions should actively respond to the national policy, accelerate the introduction of blockchain and other cutting-edge information technology, and create differentiated competitive advantages through in-depth fusion and integration of innovation, to promote the comprehensive development of financial technology. Second, to address the problem of insufficient supply of agricultural credit products, financial institutions should innovate low-risk financial products to meet the financing needs of various participants in the agricultural supply chain, while enhancing the level of risk control and innovation benefits of financial institutions. In addition, financial institutions should also focus on providing convenient financial services, and promote the development of rural inclusive finance through online exhibition and marketing activities, online consultation services and other measures. Finally, financial institutions need to reinvent themselves, create a service-oriented new finance, firmly establish a customer-centered business philosophy, and provide a full range of new multi-level financial products and attentive and convenient rural financial services, to create a highly effective service-oriented financial institutions and promote the harmonious development of the financial industry.

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