

A Study on the Operational Mechanism and Practical Experience of Digital Agricultural Industrial Chain Finance: A Case Study of Leading Enterprise Dominant Model

Jianing Liang *

School of Finance, Nanjing Agricultural University, Nanjing 210095, China

* Corresponding Author Email: 16320208@stu.njau.edu.cn

Abstract. To alleviate the credit constraint problem of farmers, a financial model of the agricultural industry chain has emerged in China, and has undergone digital transformation with the development of digital technology. In order to explore the operation mechanism of the digital agricultural industry chain finance, this study, based on the review of its typical models, takes the leading enterprise dominant model as an example. Combining the case of chili agricultural industry chain finance in Xiangcheng County, Henan Province, this paper starts from the problems existing in the local traditional industry chain finance, and analyzes the specific process and operation mechanism of the leading enterprise dominant digital agricultural industry chain finance model. The study finds that the local digital agricultural industry chain finance has realized direct data transmission between farmers and financial institutions by building its own e-commerce platform within the leading enterprises. This helps to improve the efficiency of farmer loans, reduce the cost of risk identification for financial institutions, optimize the efficiency of capital turnover, and thus break through the drawbacks of traditional industry chain financing methods, easing the credit constraints faced by farmers. The possible contribution of this paper is that by analyzing the breakthroughs achieved in the digital transformation process of the chili industry chain finance in Xiangcheng County, it provides empirical references for the development of digital agricultural industry chain finance in China.

Keywords: Digitalization, Agricultural Industry Chain Finance, Leading Enterprise Dominant Model, Operational Mechanism, E-commerce Platform, Case Study.

1. Introduction

The lack of financial support is the primary issue restraining the development of agriculture in China, mainly manifested as the credit constraint problem for farmers. The emergence of agricultural industry chain finance provides an effective solution to this problem [1]. In recent years, with the development of digital technologies such as rural e-commerce, big data, and the Internet of Things, traditional industry chain finance has begun to seek digital transformation. Up to now, there have been several innovative cases of digital agricultural industry chain finance in China, such as the "Internet plus Agricultural Industry Chain Finance" model that covers the entire pig industry chain created by Beijing Dabeinong Technology Group Co., Ltd. [2], the "E-commerce Platform plus Agricultural Industry Chain Finance" model built by Ant Financial in collaboration with leading agricultural enterprises [3], and the digital agricultural industry chain finance based on the "Retail Credit Preposition System" jointly launched by the Sichuan Branch of China Post Savings Bank and Sichuan Xiangtong Information Technology Co., Ltd. [4].

According to the definition by Miller et al., agricultural industry chain finance refers to the process whereby financial products and services are able to connect different participants in the agricultural industry chain, thereby alleviating its limitations on the development of the entire industry chain by improving financing channel [5]. Compared with traditional financial financing methods, agricultural industry chain finance has a stronger ability to identify loan risks, therefore it can reduce the financing costs and risks for small farmers and enable them to obtain resources from higher-value markets [6]. However, existing studies have shown that although the emergence of traditional agricultural industry chain finance has alleviated the credit constraint problem of farmers to a certain extent, it still has many limitations. Zhou Yueshu et al. emphasized that under the traditional agricultural industry chain

finance model, farmers often find themselves in a passive position, and their real loan demands can hardly be effectively met [7]. Zhou Yueshu et al. further found that the root cause of traditional agricultural industry chain finance's inability to effectively play its role lies in the imperfect credit system and immature risk control [2]. Xu Yuyun and Zhang Longyao proposed that traditional agricultural industry chain finance has always had problems in practical operation, such as high credit transaction costs for farmers, insufficient internal financing ability and incentives for agricultural enterprises, difficulties in supervising the use of loan funds resulting in fund conversion risk, and difficulties in effectively transmitting internal industry chain information to external financial institutions [3]. In response to these problems, traditional industry chain finance is actively seeking new development ideas, resorting to digital applications and technologies such as big data, the Internet of Things, and e-commerce platforms, to transition and upgrade to digital agricultural industry chain finance, and has formed the following three typical models in specific practice in China, see in Table 1.

Table 1. Three typical agricultural industry chain finance models in China.

Name	Definition	Operational Model Diagram
Bank-Led Model	Traditional banks, leveraging their long-term advantages in capital and technology, build and constantly update their own trading platforms based on existing mobile banking, online banking, and bank e-commerce foundations, providing customers with online payment and settlement services.	
E-commerce Platform-Led Model:	Internet technology companies establish an industry chain with leading agricultural enterprises using mature e-commerce platforms. Upstream farmers in the industry chain establish stable order contract relationships with the leading enterprises. Both the production and sales of agricultural products can be carried out on the e-commerce platform, which in turn aids farmers in their agricultural production and loan repayment.	
Leading Enterprise-Led Model	Leading enterprises build an e-commerce platform inside the company using technologies such as the Internet of Things and provide the order and production transaction data of farmers accumulated on the internal platform to the internet financial platform or financial institution partners. This provides a data foundation for financial institutions to scientifically construct credit scoring models and provides a series of financial services such as loans, insurance, and physical financing for order farmers.	

Theoretically, by leveraging digital applications and technologies such as big data, the Internet of Things, and e-commerce platforms, digital agricultural industry chain finance can to some extent save

transaction costs, establish a digitized credit enhancement system, enhance risk control capabilities, and ultimately improve the efficiency of rural financial supply [3]. Moreover, the data and information flows permeating the entire process of industry chain production and operation can theoretically provide a data foundation for the establishment of a digital credit system, alleviate information asymmetry between borrowers and lenders, balance the transaction status of various subjects in industry chain finance, and thus effectively solve the key factors restricting effective financing of farmers [2]. So, can digital agricultural industry chain finance play its theoretical role and advantages in actual operation? What new problems and limitations will arise in this process? To answer these questions, this paper intends to take the leading enterprise-led model in digital agricultural industry chain finance as an example, analyzing the operation mechanism of chili industry chain finance led by the "Jiaosheng" enterprise in Xiangcheng County, and on this basis provide policy recommendations for China's further development of digital agricultural industry chain finance.

2. Data and Method

2.1. Data Collection

The data collection began in 2020 and lasted for nearly half a year, mainly including literature review, data collection and analysis, and in-depth case analysis. First, prior to the field research, the project team obtained external data through the company's official website, news information, online keyword searches, and more. At the same time, the project team conducted email exchanges and interviews with the village secretary of Xiangcheng County, Henan Province, to understand the local basic conditions and suitable times for research. Next, the project team conducted field research in Xiangcheng County, Henan Province, visited the local "Jiaosheng" leading enterprise and chili industry base, and interviewed the company's leaders, village secretary, and chili growers. Finally, the project team extracted useful information for data supplementation from the data reports provided by the "Jiaosheng" company and banks.

2.2. Method and Case Selection

This paper will focus on the analysis of the leading enterprise-led model in digital agricultural industry chain finance, and has chosen the chili agricultural industry chain finance led by Jiaosheng Agricultural Development Co., Ltd. (hereinafter referred to as "Jiaosheng") in Xiangcheng County, Henan Province as the case study object, for the following specific reasons:

Firstly, it is representative in the industry. China is the world's largest producer, consumer, and exporter of chili peppers, and the chili industry holds an important position in China's agricultural production. From the perspective of development history, the chili industry chain in Xiangcheng County has a long history and is advancing with the times, characterized by high quality, modernization, and intelligence. From the perspective of the industry chain operation, "Jiaosheng" has formed a relatively stable contract relationship with local growers, has mature technologies such as cloud computing, the Internet of Things, big data, and has a rich history of industry chain data. Its industry chain finance operation method is typical. Therefore, choosing "Jiaosheng" in Xiangcheng County, Henan Province as the research object provides an excellent case sample for exploring China's leading enterprise-led digital agricultural industry chain finance.

Secondly, it has a forward-looking nature in terms of the development model of industry chain finance. In today's Chinese chili industry chain, only a very few leading enterprises can dominate local digital agricultural industry chain finance and achieve significant results. With the support of the local government, "Jiaosheng" not only established a chili loan e-commerce platform in 2020, but also cooperated with the local Zhongyuan Rural Commercial Bank to successively launch loan products such as Xingnong Loan, Suixin Loan, and Fushang Loan, establishing a virtuous cycle of the leading enterprise-led digital agricultural industry chain finance operation model in the local area,

which has achieved good results in alleviating local farmers' credit constraints and promoting local capital turnover.

3. Case Analysis

3.1. Constraints on the Development of Local Traditional Industry Chain Finance

The traditional industry chain finance in the local area has the following problems in its actual development: firstly, the capital demand side has to bear a larger credit transaction cost. Spatially, offline business handling channels and scattered bank branches greatly limit the convenience of farmers' loan processing; temporally, the cumbersome loan application process and the long loan application period make it impossible for farmers to obtain timely capital replenishment through formal lending when they urgently need funds, forcing them to give up loan applications. Secondly, the capital supply side has to bear a larger risk identification cost. Before lending, due to the high uncertainty of returns in the chili planting industry, financial institutions are cautious about lending to the industry's operators; after lending, due to the difficulty in supervising farmers' operations and lending behavior, financial institutions face the moral risk of loan farmers converting the use of funds. Thirdly, the turnover efficiency of the capital market is low. On the supply side, due to the lack of timely and effective market information, chili growers find it difficult to make correct decisions on chili production and operation; on the demand side, due to the lack of understanding of local chili products, chili demanders find it hard to quickly make purchase decisions on local chili. Therefore, the ability to monetize chili is not strong enough, and the turnover efficiency of the capital pool is low.

The existence of the above problems means that traditional agricultural industry chain finance cannot satisfy the farmers' growing credit needs, and farmers face the dilemma of difficult and expensive financing in the industry chain, which restricts the further development of the local industry chain.

3.2. Digital Transformation of Local Industry Chain Finance

3.2.1 Specific Operational Process

Against this backdrop, Xiangcheng County has actively sought the transformation and upgrade of the local chili industry chain finance. To date, "Jiaosheng" has formed a complete and mature operation model for the leading enterprise-led digital agricultural industry chain finance, as shown in Figure 1.

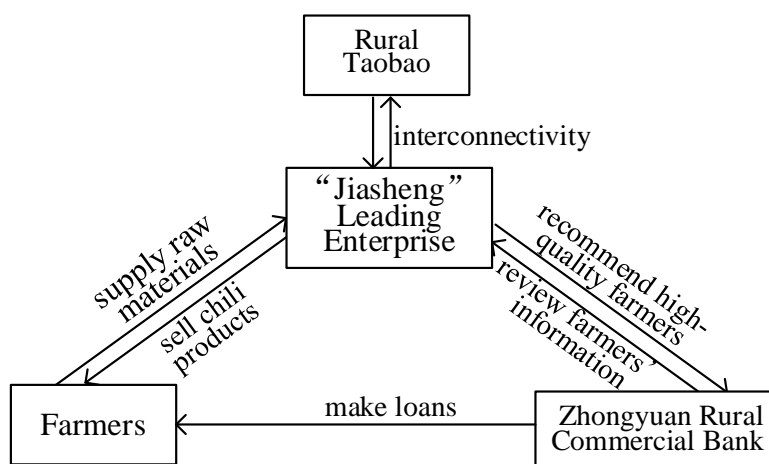


Fig. 1 Operation Flowchart of Digital Agricultural Industry Chain Finance Led by "Jiaosheng" Enterprise.

Firstly, "Jiaosheng" signs order contracts with growers, establishing business connections. On the one hand, the interconnection between the internal e-commerce platform of "Jiaosheng" and the rural

Taobao platform provides growers with richer channels for purchasing chili raw materials; on the other hand, "Jiaosheng" purchases finished chili products cultivated by the growers. In the aforementioned process, "Jiaosheng" uses the latest cloud computing, Internet of Things, and big data technologies to capture the production and transaction data of farmers, enabling internal data accumulation related to farmers, providing a data foundation for subsequent information visualization between farmers and banks.

Secondly, "Jiaosheng" reviews and selects high-quality growers based on the degree of long-term stability of the contractual relationship with them, and then recommends them to the Zhongyuan Rural Commercial Bank. On one hand, "Jiaosheng" can preliminarily judge the creditworthiness of farmers based on their contract performance. On the other hand, through the analysis of farmers' production and transaction data, the enterprise can gain a deeper understanding of the farmers' production income situation and transaction behavior, thereby assessing the farmers' credit repayment ability. Therefore, by comprehensively considering the farmers' creditworthiness and credit repayment capacity, the enterprise can help the bank to screen out high-quality farmers with good credit status to some extent. In the process of recommending farmers, the internally built e-commerce platform of the enterprise will synchronously provide the Zhongyuan Rural Commercial Bank with the historical production and transaction data of the corresponding growers, preparing for the bank's cross-verification in the next step.

Thirdly, the Zhongyuan Rural Commercial Bank verifies the information of the high-quality farmers recommended by the enterprise. If they meet the requirements, the bank offers them chili loans. Prior to lending, the digital footprint embedded in the e-commerce platform provides the most important data source for setting the coefficients of the bank's risk control model. The bank will set the credit coefficient based on several factors such as the stability of the growers' production scale and income sources, personal asset-liability and credit situation, and multiply it by the expected sales income of the farmers to obtain the loan amount. A more personalized and effective lending limit helps improve the precision of the bank's lending. After the loan is issued, the Zhongyuan Rural Commercial Bank adopts a targeted fund payment system. Loans issued through this system cannot be withdrawn in cash but only allow farmers to purchase agricultural inputs and tools required for agricultural production on the "Jiaosheng" internal e-commerce platform or rural Taobao, which helps control the flow of lending funds.

In addition, "Jiaosheng" maximizes the sales gains of farmers' chili products through both online and offline channels. For the online part, "Jiaosheng" opens a store on the comprehensive shopping platform Tmall to enhance the brand influence of local chili products and explore their customer acquisition potential. For the offline part, with the support of the Xiangcheng County government in Henan Province, "Jiaosheng" actively invests funds to establish cold storage in the chili industry base. The establishment of cold storage helps to extend the preservation time of chili, thereby reducing the loss of chili spoilage due to unsold chili.

3.2.2 Path to Alleviate Credit Constraint Issues

Based on the aforementioned analysis of the specific operational process of the case, this paper further studies the mechanism by which the digital agricultural industry chain finance led by "Jiaosheng", a leading chili enterprise, alleviates the credit constraint problems of farmers. The research finds that, compared to before the digital transformation, the leading enterprise-led digital agricultural industry chain finance of "Jiaosheng" now has at least the following three paths of action, as shown in Figure 2.

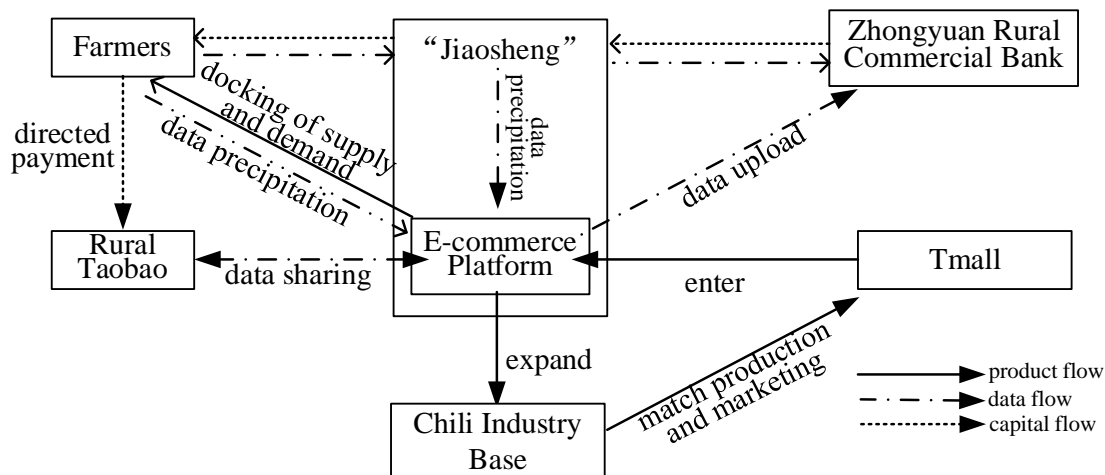


Fig. 2 Action Pathway Diagram of Digital Agricultural Industry Chain Finance Led by "Jiaosheng" Enterprise.

Firstly, it reduces the credit transaction costs borne by the capital demand side. The series of e-loan products launched by the Zhongyuan Rural Commercial Bank do not require offline applications and manual approvals. Farmers can follow up on online loan applications and approval stages anytime and anywhere through the Zhongyuan Rural Commercial Bank mobile APP. At the same time, unlike the usual practice where farmers provide their own credit proof, the leading enterprise will upload the historical production transaction data of farmers deposited on its own e-commerce platform to the bank for reference and assessment. The advantage of this method is that: spatially, it overcomes the high operating costs of traditional physical network branches and the long round trip for farmers, allowing farmers to carry out online loan operations in any networked area; temporally, it overcomes the drawbacks of cumbersome loan procedures and long loan cycles in traditional situations, reducing the burden on farmers to prepare a large number of supporting materials. Based on this, the spatio-temporal limitations of farmers' loans under the traditional agricultural industry chain financial model can be broken through, which greatly enhances the willingness of farmers to take loans, thereby helping to alleviate the problem of farmers' credit constraints from the demand side.

Secondly, it reduces the risk identification cost borne by the capital supply side. The Zhongyuan Rural Commercial Bank, by leveraging the e-commerce platform established within "Jiaosheng" and the rural Taobao e-commerce platform, breaks the information asymmetry and inequality among the various subjects on the industry chain through digital technologies and means, and builds a communication coordination mechanism where all subjects participate together. In the pre-loan audit stage, the Zhongyuan Rural Commercial Bank uses the historical production transaction data of farmers provided by the enterprise's e-commerce platform to understand the agricultural production capacity and debt repayment ability of the growers, in order to filter target customers and pre-authorize credit. During the loan monitoring stage, machine learning technology will continue to enhance the accuracy and precision of the digital credit risk control model prediction with the help of data streams, thereby contributing to the long-term growth of the model. In the post-loan management stage, the transaction data online enables financial institutions to monitor the flow of lending funds in real-time, thereby reducing the cost of post-monitoring. Based on this, commercial banks can reduce their pre-loan, in-loan, and post-loan risk identification costs, thereby helping to enhance their willingness to lend, and alleviate the problem of farmers' credit constraints from the supply side.

Thirdly, it enhances the turnover efficiency of capital in the market. "Jiaosheng" improves the efficiency of supply-demand matching and control over the direction of farmers' loan receipts to enhance the capital turnover efficiency of the entire agricultural industry chain. In terms of improving the efficiency of supply-demand matching, on the one hand, farmers can use Tmall to make contact with chili demanders in advance, grasp the market preference for chili quantity, variety, processed products, etc., adjust the chili planting output and planting plan in a timely manner, enhance the accuracy of supply-demand matching and the efficiency of resource utilization, thereby enabling

capital to circulate efficiently within the industry chain; on the other hand, the establishment of the chili industry base can buffer the supply-demand gap and enhance the capitalization level of agricultural products. In terms of controlling the direction of farmers' loan receipts, the transformed industry chain adopts a targeted payment management system, which can prevent the risk of farmers' loan receipts being used for conversion to a certain extent, thereby promoting the long-term circulation and turnover of lending funds in the field of agricultural production.

4. Conclusion

This paper studies the practice of digital agricultural industry chain finance in China and, taking the leading enterprise-led model as an example, selects specific cases to analyze the operation mechanism and credit constraint mitigation path of this model. The main conclusions include:

1. Currently, China's digital agricultural industry chain finance mainly falls into three models: bank-led, e-commerce platform-led, and leading enterprise-led. Among them, the leading enterprise-led model is more mature in China and is worth in-depth study.

2. In terms of operation mechanism, the leading chili enterprise "Jiaosheng" in Xiangcheng County has formed a leading enterprise-led digital agricultural industry chain finance model through cooperation with the local Zhongyuan Rural Commercial Bank. On one hand, this model forms a data flow and information flow directly connecting farmers and financial institutions by building an e-commerce platform internally, enhancing information transmission among various subjects in the industry chain and improving the capital turnover efficiency of the industry chain. On the other hand, this model maintains the intermediary status of traditional industry chain leading enterprises, and further strengthens the lending relationship between farmers and financial institutions through the credit guarantee of "Jiaosheng".

3. In terms of action pathway, "Jiaosheng" actively promotes an innovative financial model. It improves the efficiency of farmers' loans through online application and approval of loans, reduces the risk identification cost of commercial banks through pre-loan, in-loan, and post-loan data support, enhances the capital turnover efficiency through direct connection between supply and demand of agricultural products and control over the direction of lending funds, thereby effectively mitigating the financing difficulties faced by farmers under traditional agricultural industry chain finance.

References

- [1] Shao Xian. Innovation in Agricultural Supply Chain Finance Model - Taking the Mapo Vegetable Wholesale Market as an Example [J]. *Agricultural Economic Issues*, 2013, 34(08): 62-68+111.
- [2] Zhou Yueshu, Da Yujie, Yu Ying. Operational Analysis of "Internet + Agricultural Industry Chain" Financial Innovation Model - Taking the Dabeinong Pig Industry Chain as an Example [J]. *Agricultural Economic Issues*, 2020(01): 94-103.
- [3] Xu Yuyun, Zhang Longyao. Digital Transformation of Agricultural Supply Chain Finance: Theory and Chinese Cases [J]. *Agricultural Economic Issues*, 2020(04): 72-81.
- [4] Hu Xiaofeng. Practice and advancement of digital transformation of agricultural supply chain finance [J]. *Southwest Finance*, 2021(04): 52-62.
- [5] Miller C, Jones L. *Agricultural value chain finance: tools and lessons* [M]. Practical Action Publishing, 2010.
- [6] Song Yanan, Zhao Wen, Yu Maomin. The growth of the agricultural industry chain and the innovation of supply chain financial services: mechanism and cases [J]. *Rural Finance Research*, 2012(03): 11-18.
- [7] Zhou Yueshu, Wang Jie. Industrial Chain Organization, Market Forces and Agricultural Industrial Chain Financing - Empirical Analysis Based on 397 Scale Farmers in Jiangsu Province [J]. *China Rural Economy*, 2017(04): 46-58.