

## Original Paper

# Problems and Optimization of Forest Rights Mortgage Loans in China Using Blockchain

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### Abstract

*Forestry has an important role in Chinese economic development, and the forest rights mortgage loan is an important mechanism to realize the value of forest resources. Its development is a part of the important strategic guidelines of inclusive finance and rural revitalization in China. After decades of development, the forest rights mortgage loan business has been promoted throughout the country. However, it faces obstacles in practice. Blockchain technology is considered as “the most influential revolutionary technology in the next few decades. With its advantages of transparency, traceability, and decentralization, it empowers the rural economy for the development of agricultural product traceability, rural financial services, and land management. We analyzed existing problems during and after the loan and proposed an optimization method from the technical, regulatory, and application perspectives based on blockchain. The method provides a reference for the future development of forest rights mortgage loans in China.*

### Keywords

*blockchain, forest rights mortgage loan, optimized path*

## 1. Introduction

Forestry is of great significance to the Chinese economy. Forests not only provide the wood and forest products but also supply oxygen to improve air quality. China has abundant forest resources. According to the results of the 9th National Forest Resource Inventory, the total forest area in China was 220.4462 million ha, accounting for 5.51% of the global forest area. At present, the total value of the Chinese

forestry industry exceeds 9 trillion Yuan, and the annual output of forest food in the country is 200 million tons. Following grain and vegetables, forest products have become the third largest agricultural product in China.

## **2. Development of Forest Rights Mortgage Loan in China**

On August 15, 2005, Comrade Xi Jinping put forward the scientific proposition that “green mountains and clear water are as valuable as gold and silver” during his inspection in Anji. Vigorously promoting the forest rights mortgage loan business has turned dormant forest land into cash, which is an effective way to implement this theory. According to the mortgage rate of 30%, the national forestry industry generates 2.70 billion Yuan in loans which solves the financing difficulties of forest farmers. Forest assets have no depreciation as plant, machinery, and equipment mortgage and are a renewable resource with the potential to maintain and increase value. As long as the circulation of forest rights is ensured, forest trees become collaterals for feasible mortgage loan. Therefore, developing forest rights mortgage loans adjusts the rural industrial structure and increases the benefits of commercial banks.

To develop forest rights mortgage loans, the State Forestry Administration issued the Measures for Mortgage Registration of Forest Resource Assets (Trial) in May 2004. The measures provide detailed procedures for the scope, registration, renewal, cancellation, and other procedures of forest rights mortgage loans. In 2008, the State issued the Opinions of the CPC Central Committee and The State Council on Comprehensively Promoting the Reform of the Collective Forest Rights System. In 2013 and 2018, the Opinions on the Implementation of Forest Rights Mortgage Loan and the Notice on Promoting the Related Work of Forest Rights Mortgage Loan were promulgated. Subsequently, Guizhou, Fujian, Zhejiang, Guangdong, Jiangxi, Anhui, Shandong, and other provinces launched pilot projects. Local documents such as “Shandong Province Forest Rights Mortgage Loan Management Measures (Trial)”, and “Jiangxi Province Public Welfare Forest (Natural Commercial Forest) Compensation Loan Management Measures (Trial)” have been published. New forestry financial products such as the “forest right loan”, “Fulin loan” and “forest farmers fast loan” also have been provided. In 2010, the balance of the forest rights mortgage loans nationwide was more than 10 billion Yuan. After years of efforts, it has increased to more than 170 billion Yuan.

## **3. Problems in Forest Rights Mortgage Loan**

After decades of development, the business of forest rights mortgage loans has been promoted throughout the country. However, the current forest rights mortgage loan in China still faces problems before, during, and after the loan, manifested in the following aspects.

### 3.1 Before Loan

There is a problem of inaccurate credit evaluation of borrowers due to the information asymmetry of financial institutions. Due to the dispersed living locations of borrowers and the uneven value of forestry resources, a significant information asymmetry exists between financial institutions and borrowers. Several regions have explored multi-department collaboration mechanisms and established cross-departmental data asset interaction platforms such as Lishui City in Zhejiang Province with forest asset information cards on a household basis and launched pilot projects using digital forest rights information and resource evaluation. However, current information platforms still use traditional centralized architectures to store data. Centralized architectures cannot effectively prevent system failures caused by hacker attacks and offer poor security in data collection and sharing processes, potentially leading to unauthorized modifications of data by administrators. Moreover, due to the lack of unified standards, traditional data platforms adopt varying quality data, significantly impacting data usability. Traditional centralized data platforms pose higher risks and fail to truly share data information, leading to a serious “data silo”. Financial institutions often lack reliable customer data and rely on past experiences to make judgments, resulting in conservative decisions that are far below the actual value of the forest land. For example, a forestry planting company in Qionglai City, Sichuan Province, operates nearly 3,000 acres of forest land, which is mature Chinese fir artificial commercial forest, with a valuation of over 20 million Yuan, yet the loan amount is only 10% of the valuation.

### 3.2 During Loan

There are problems related to complex loan procedures, low efficiency, and high transaction costs. From the perspective of the lender, due to the dispersion of forest farmers, the small scale of the unit loan, the information cost shared by a single loan, and the evaluation cost of forest rights collateral, the transaction cost of the contract is very high. Due to the particularity and complexity of forestry, forestry resources as collateral require financial professionals to understand the financial and professional knowledge of forestry. As this requires considerable time and energy, the opportunity cost of forest rights mortgage loans is increased, reducing the interest of financial institutions to borrow.

The borrowers also have a problem with high costs. In 2009, the national forestry departments jointly issued Opinions on Reforming the Collective Forest Rights System and Providing Financial Services for Forestry Development. The document stipulated that the actual loan interest rate could not exceed 1.3 times the interest rate stipulated by the People’s Bank of China. In reality, due to the long forestry production cycle, the high management risk, and the vulnerability of forestry borrowers, the risk of forest rights mortgage loans greatly increased. If the financial institutions cannot deal with the collateral, the risk can only be compensated by raising the loan interest rate. For example, in the Sanming area of Fujian Province, the annual interest rate of forest rights mortgage loans was as high as 10.32%.

### *3.3 After Loan*

There is a lack of a perfect forest rights circulation service system and difficulty in the disposal of collateral. The ideal collateral is stable in value and easy to convert into liquid assets. The mortgage of the forest rights mortgage loan refers to the usufruct of forest land or trees. The forest rights mortgage has poor measurement reliability and liquidity, so the forest rights mortgage loan has a higher credit risk. At present, China has not yet established a sound forest rights transfer system, and various regions have not yet formed a sound forest rights transfer market. According to the Forest Law of the People's Republic of China, the state implements synchronous planning for logging and cultivation and strictly controls the annual logging volume of forests. Besides logging requires obtaining a logging permit first, there are also many implementation processes and restrictions. In addition, the lack of unified and standardized contracts makes it easy for disputes and controversies to occur after a transfer, which increases the concerns of financial institutions in issuing forest rights mortgage loans. As of the end of 2018, the transfer rate of collective forest rights was less than 10%, and the process of converting forest resources into capital still is complex.

## **4. Blockchain for Forest Rights Mortgage Loan**

Blockchain is based on a point-to-point, decentralized, and distributed ledger that stores data records in a blockchain structure with continuous encryption, ensuring the consistency and durability of data in the whole network. Blockchain creates an open and transparent environment in which data records are stored in an unmodifiable and traceable way. Blockchain enables the rural economy to have various advantages for the development of agricultural products and land management with traceability.

### *4.1 Before Loan*

Blockchain is helpful to break the “data silo” of traditional information systems. Blockchain is a technical means to solve the problem of information acquisition, especially in the enterprise “soft information” acquisition. Blockchain distributes data on multiple nodes to avoid single-point failure affecting the normal operation of the whole system and improving the reliability of the system. Blockchain uses a blockchain data structure to store and verify data and enhance the confidentiality of data. Timestamp technology is used to ensure traceability and avoid tampering with scientific data. It clarifies the ownership of data information and prevents situations where collateral is repeatedly sold or mortgaged.

The application of blockchain enables the accurate filing of farmer information. The basic information of farmers, the credit situation of farmers, forestry operation status, and forest land circulation are incorporated into the information management system to provide information for financial institutions for forest rights mortgage loan business with the whole-process tracking of collateral. The integration of blockchain into the forest evaluation process produces scientific, complete, objective, and fair

valuation results and enables a reliable data platform and solutions for the problem caused by huge data collection occurring in the traditional evaluation process by effectively standardizing the evaluation process. Blockchain connects the credit investigation data platforms of various financial institutions and integrates information on co-construction and forestry data. The data can be shared by financial institutions, farmers, forestry departments, and other departments. For example, LinkEye is a set of credit systems based on blockchain. In the system, personal credit is recorded by financial institutions to blockchain on the personal “book”, then broadcast to the entire network to build a complete “credit points evaluation system”. It reduces the cost of the borrowers, eases the financial institutions’ excessive reliance on collateral, and creates a sound ecological environment for the development of forest rights mortgage loans.

#### *4.2 During Loan*

Blockchain helps to build an intelligent, low-cost, and efficient forest rights mortgage loan service system. The borrower information compiled in the blockchain is diverse and objective and can be used to effectively solve the problems of adverse selection and moral hazard. Blockchain provides the intelligence of the loan process, reduces labor, and the customer loan application time, and improves the operational efficiency of financial institutions. Smart contracts replace credit approval rules with computer language. When the submitted credit data meets the smart contract standards, the approval is given timely. It prevents ineffective communication between departments in the credit approval process and makes the approval results more stable and more accurate. Blockchain transforms forest assets into digital assets and enables remote monitoring and data collection. Combined with big data technology for data analysis and early warning and prediction, it avoids the stealing of mortgaged trees without the cutting certificates. Blockchain also enables the online services of forest rights mortgage loan businesses from the selection of loan objects to borrowers’ repayment, loan management, and other processes. It reduces the time for business in a day or two. For example, the “Wuping County Forestry Finance Blockchain Financing Service Platform” constructed by Wuping County in Fujian Province shortened the time for forest farmers to lend from 7 to 15 days to 2 days through the online forest rights mortgage loan.

#### *4.3 After loan*

Blockchain + asset securitization activates the liquidity of forestry assets and improves the efficiency of credit funds. The application of asset securitization in forest rights mortgage loans is beneficial for forestry assets with low credit ratings and high-risk levels to enter the capital market and issue medium- or long-term securities. It is also beneficial for financial institutions to activate the liquidity of loan assets. In 2006, scholars proposed the use of asset securitization in forestry financing to solve the shortage of forestry funds. Asset securitization is a financial innovation with advantages and disadvantages. It activates forest rights assets while excessive securitization causes a crisis. The asset

securitization transaction structure is complex, the transaction chain is relatively long, and the information asymmetry problem is serious. In asset securitization, the sponsors and securities intermediaries leverage their advantages to find the quality information of basic assets, infringe on the interests of investors, increase market risks, and cause market chaos. The introduction of blockchain into asset securitization improves security and credibility. Distributed ledgers are used to improve information transparency and establish complete, tamper-proof, traceable information clues, including the sponsor loan standard changes, loan pool asset quality, loan default amount, and securitization products credit rating changes. The key information is permanently recorded, updated, and published in real time. Blockchain realizes peer-to-peer instant payment, simplifies the transaction process, and greatly shortens the payment time. With the introduction of blockchain, each asset in the asset pool is linked securely, which eliminates the possibility of repeated mortgages. All these contribute to overcoming the disadvantages of the complex structure of securitization and improve the security and stability of securitization.

## **5. Optimization of Forest Rights Mortgage Loan In Blockchain**

Although the blockchain provides convenience to both forest farmers and financial institutions, the current blockchain-based forest rights mortgage loan business is still in the pilot stage on a limited scale. To integrate blockchain and forest rights mortgage loans, the following efforts are necessary.

### *5.1 Technical Level*

Local governments must actively use blockchain to build a forest rights mortgage loan information platform and communicate with financial institutions. Local governments need to guide the construction of forestry financial information platforms using blockchain and share relevant information input standards. Each farmer is a data node of the blockchain, and the local branch of each financial institution is taken as a collection point. Each collection point conducts a preliminary review of the authenticity of the information, and then the authenticity of the data is verified through the consensus mechanism. The relevant information on forest farmers, such as holding assets, collateral, credit status, etc. in the blockchain must be shared by establishing a regional sub-database. The database of financial institutions needs to be shared. It is needed to break information barriers by sharing the data of the central bank, public security, tax offices, and other departments in the blockchain, and pre-loan credit evaluation for borrowers must be conducted using various data. The blockchain information platform can have a variety of functions, such as data management, information feedback, and information updates to establish a real, reliable, comprehensive, and perfect blockchain platform.

### *5.2 Regulatory Level*

A country needs to issue relevant policies, unify standards, and innovate regulatory means to improve the level of supervision. It is necessary to unify the blockchain industry standards and timely revise the existing policies and regulations. The regulatory strategies of the regulatory system and lessons from the foreign regulatory system of blockchain (such as the “regulatory sandbox” in the UK) must be integrated. When abnormal situations are found, the problem must be traced according to the timestamp of the blockchain. With the financial regulatory authorities as the core, the central Bank, National Financial Regulatory Administration, China Securities Regulatory Commission, Forestry Bureau, Data Bureau, and other departments must cooperate closely to integrate the responsibilities of multiple authorities, promote the sharing and opening of regulatory information, and jointly formulate the regulatory rules for the securitization of forest rights mortgage. Authoritative institutions must participate in the blockchain forest rights mortgage assets securitization alliance and expand the pilot projects. The joint efforts are necessary for off-site supervision and risk early warning at the supervision level of forest rights mortgage loans and related assets securitization business.

### *5.3 Application Level*

It is necessary to pay attention to the cultivation of experts to strengthen the publicity and education efforts, increase the infrastructure construction, and provide a good application environment for the forest rights mortgage loan business. The application of blockchain technology to forest rights mortgage loans requires the credited staff to master the professional knowledge and understand the underlying design of blockchain in the specific application process. There are higher requirements for China’s talent training system. In higher education, training programs for “blockchain + finance” must be established to teach the knowledge of various subjects to students. Financial institutions need to provide training programs to improve the ability of employees to use blockchain technology and avoid operational risks.

The participation of borrowers is also important. Local governments must increase publicity to help farmers understand the business process in the blockchain through the Internet, radio, telephone, and other media. The local government and various parties need to invest and construct the communication network and infrastructure equipment in rural areas to provide an appropriate environment for the forest rights mortgage loan business.

## **6. Discussion**

With the support of blockchain technology, the long-standing challenges in the forest rights mortgage loan business can be effectively addressed. Blockchain technology empowers every aspect of the entire loan process, enhancing the efficiency of forestry loans and enabling financial institutions to truly fulfill their social responsibility of “inclusive finance”. However, embedding blockchain technology

into China's credit system still requires a process, and only with the joint efforts of all sectors of society can we achieve the goal of activating the value of forest resources.

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