

Study on the Path of Financialization of Agricultural, Rural and Farmer Data Assets under the Background of Rural Revitalization Strategy

Jing Zhao*

Shanghai Communist Youth League School, Shanghai 200083, China

**Author to whom correspondence should be addressed.*

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Abstract: With the in-depth implementation of China's rural revitalization strategy, data financialization will become an important means to promote agricultural modernization and rural economic development. At the practical level, the financialization of agricultural, rural and farmer (hereafter referred to as "three rural issues") data can realize the collection and integration of data in agricultural production, circulation, and consumption links by building agricultural data platforms, thereby forming a closed-loop management system. In trust practice, it is particularly important to explore a management model based on data trust. Through data mining technology, a comprehensive analysis of farmers' income levels, production costs, market demand, and other factors is conducted to achieve precision in the design of trust products. Carrying out interdisciplinary cooperative research and integrating relevant theories and methods of agricultural economics, data science, and finance can provide systematic solutions for the financialization of three rural issues. The economic attribute of data has been increasingly recognized and emphasized. Data trust provides a new perspective and new ideas for effectively balancing the data rights and interests structure between data subjects and data controllers, safeguarding data security, and promoting and ensuring the healthy development of the data market. This paper will focus on the new model of three rural issues data governance through data trust.

Keywords: Rural revitalization; Data assets; Financialization

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1. Overview of current domestic and international research

Domestic research in China mainly focuses on the legal perspective of data asset confirmation, and has made breakthroughs in the direction of data asset valuation and book entry, but has not yet solved key issues such as data asset financialization. International research focuses on the field of "information fiduciary" and has formed the academic viewpoint of independent management by fiduciaries, but there is a limitation that research practice is inconsistent with theory. At present, similar projects funded by China's National Social Science Fund focus on the confirmation and valuation of data assets, leaning towards the fields of law and sociology. The breakthrough

of this paper lies in solving the closed-loop design of data financialization, such as the monetization, transaction and income distribution of data assets at the backend. It mainly uses finance and economics to solve the effective transformation of three rural issues data under China's digital strategy, so that data trust can better contribute to the comprehensive revitalization of rural areas.

2. Definition of the scope of research objects and their economic value

Research Objects: The specific research objects are personal agricultural data within agricultural data that have completed rights confirmation, listing, and trading on major local data exchanges. Currently, they mainly focus on agricultural data generated during the production, sales, and other links of agricultural products and local specialty products.

Guided by the goal of data financialization, the overall objective is to realize the monetization, tradability, and circulation of rural, agricultural, and farmer (Three Rural Issues) data assets: to construct a data asset financialization trust model suitable for the Three Rural Issues field and help farmers increase property income. By sorting out the classification characteristics and application scenarios of agricultural data, this paper explains the rights confirmation and transaction mechanism of agricultural data assets (front-end) and proposes an optimized path for the income distribution of agricultural data assets (back-end).

The Three Rural Issues data have significant economic value. Firstly, financial raising using farmers' information can provide financial support for agricultural production^[1]. For example, precise lending methods or supply chain finance methods can set credit limits for farmers based on their historical production information and credit records, and reduce potential risks by virtue of the law of large numbers. For instance, banks can provide loans to farmers after studying their annual income over the past three years and the current market price trend. In addition, information on agricultural product market prices and output can also serve as data support for agricultural product futures trading, thereby enabling farmers to better connect themselves with the market and improve their own benefits. Secondly, the Three Rural Issues data also have great value in the insurance field. Insurance institutions can use the information and data provided by farmers to understand weather conditions, soil quality, epidemic disasters, pest disasters, etc., and then accurately control relevant information through insurance products. This can achieve a more accurate prediction of potential risks, thereby helping to reduce the proportion of compensation costs that insurance companies need to pay.

Furthermore, the introduction of data analysis and intelligent decision-making in agricultural production can significantly improve resource utilization efficiency. The realization of full-chain data sharing through technologies such as the Internet of Things and blockchain not only optimizes the production process but also enables precise fertilization and irrigation, increasing the unit output of crops. Specifically, in a certain region, the implementation of precision agriculture technology has increased the per-mu yield of rice, reduced water resource usage, and promoted sustainable development. The standardization and sharing of agricultural data will bring new business models, thereby spawning new economic value. Platform-based agricultural economy integrates information, such as farmland data and market demand, connects multiple participants, including farmers, processing enterprises, and consumers, and improves the efficiency of the overall supply chain.

3. Technical paths for the financialization of “Three Rural Issues” data assets

3.1. Classification of agricultural data and its main application scenarios

The classification of agricultural data and its main application scenarios include: agricultural production data,

agricultural resource data, supply chain and market data, operation and financial data, scientific research and technical service data, policy and macro data, as well as consumer and terminal data. With the development of smart agriculture (such as digital twins and AI-based plant protection), agricultural data assets are becoming a core element for improving production efficiency, optimizing supply chains, and driving innovation in agricultural finance.

3.2. Transforming agricultural data into effective data assets

To transform agricultural data into effective data assets, it is necessary to complete data collection and standardization, data governance and confirmation of rights, and data value mining. Eventually, it is reflected in the following data asset application scenarios: First, agricultural production and operation. Precision agriculture: Variable fertilization based on soil data to reduce chemical fertilizer use. Second, intelligent breeding: Automatic adjustment of feed formulas through livestock and poultry growth data. Third, supply chain finance: Using production data as collateral to help farmers obtain loans. Insurance institutions use disaster data to develop index insurance (such as automatic claims settlement triggered by drought index). Fourth, market services: Publishing agricultural product price indices to guide farmers to choose the right time for sales. Consumers scan codes for traceability and check the whole production data (such as blockchain + QR code). Fifth, policy and scientific research: The government uses plot-level data to accurately distribute subsidies (such as crop rotation and fallow monitoring). Scientific research institutions share genetic data to accelerate breeding (such as a rice disease-resistant gene bank). Through the above paths, agricultural data can be transformed from raw information into core assets that drive decision-making, reduce costs and create income, ultimately promoting agriculture from “experience-driven” to “data-driven” [2].

3.3. Financialization practice of agricultural data assets

The main financialization practice plan for agricultural data assets is data trust:

- (1) Key steps to realize the financialization of agricultural data: data right confirmation and compliance, data standardization and credibility enhancement, and data valuation and pricing – including the cost approach (cost plus for data collection, storage, and analysis), the income approach (forecasting the cash flow brought by data in the future, such as yield gains from precision farming), and the market approach (referring to transaction prices of similar data, such as the market price of meteorological data).
- (2) The financialization of agricultural, rural and farmer-related data assets requires ecological synergy conditions: the government provides data opening platforms (such as land right confirmation data of the Ministry of Agriculture and Rural Affairs), technology companies provide data analysis tools (such as remote sensing AI and the Internet of Things), and financial institutions design data-driven financial products.

3.4. Exploration of practical models for agricultural data trust

3.4.1. “Government Guidance + Market-Oriented Operation” dual-track trust

- (1) Farmers/cooperatives (data providers) and trustees: licensed trust companies + technology enterprise consortia. Supervisor: local agricultural and rural affairs bureau.
- (2) Operation process: The government provides initial data (such as confirmed land parcel information) and endorses credit; trust companies integrate farmers’ dynamic data (output, agricultural machinery operations); technology enterprises develop data products (such as pest and disease early warning

models); benefits are distributed proportionally (farmers, trusts, and risk reserves each account for a certain proportion).

3.4.2. “Industrial Chain-Led” data trust

Leading agricultural enterprises jointly establish a vertical field data trust with upstream breeding households. Data income rights are used to replace traditional order pledges: farmers invest in the trust with breeding data, and enterprises purchase agricultural products at a premium based on data quality; blockchain deposit ensures data immutability ^[3].

3.4.3. “Inclusive Finance + Data Trust” innovation

Rural commercial banks act as trustees, and farmers’ data trust shares are directly converted into loan quotas. The operation plan can be designed as every 1GB of effective agricultural data, yuan of credit line; a reinsurance mechanism is introduced to hedge against the risk of data valuation fluctuations.

3.4.4. “Carbon Sink Data Trust” (Potential model)

Implementation path includes trust institutions uniformly managing the carbon sink data increased by farmers’ conservation tillage, connecting to the national carbon market for transactions, and returning benefits to farmers; the government additionally issues green agricultural subsidies.

The implementation of China’s agricultural data trust requires the dual-drive of precise policy supply (confirmation + incentive + standard) and hierarchical model innovation (government-led/industry-led/finance-embedded). Priority should be given to pilot projects in large-scale planting areas and regions with improved digital infrastructure. Through the mechanism of “data investment + guaranteed income + excess share,” farmers’ annual income can be increased, while injecting new momentum into rural revitalization ^[4]. The potential scale of China’s agricultural data trust depends on the degree of data assetization, policy promotion speed and market acceptance. Based on existing data and trend analysis, it is expected that a market scale of 300–500 billion yuan may be formed by 2030.

4. Issues to be addressed for the financialization of agriculture, rural areas, and farmers-related data

4.1. Selecting agricultural data assets suitable for the data trust model

The right to benefit from agricultural data (such as remote sensing data subscription fees and agricultural technology service shares) requires long-term and stable operation, but individual farmers or small and medium-sized enterprises are unable to manage it independently. The trustee (trust company) manages the data asset pool uniformly and packages it into securitized products. Farmers, as settlors, receive profit distribution in proportion to their data contribution.

- (1) Applicability to data trading markets (sharing and trading): Scattered agricultural data (such as plot-level soil data and climate records) needs large-scale integration to generate high value, but farmers lack bargaining power. As a neutral third party, the trust acts as an agent for farmers to negotiate with buyers (seed companies, insurance companies) to ensure fair data pricing. Transaction proceeds are automatically distributed through smart contracts (e.g., a fee is paid each time the data is accessed) ^[5].
- (2) Applicability to data pledge financing (credit enhancement): The value of individual farmers’ data

assets is low and the risk control is difficult, but they can be used as collective credit collateral after being scaled up. The trust integrates data from multiple farmers to form an asset package and provides unified pledge to banks. In case of default, the trust can dispose of the data assets (e.g., directional sale to research institutions) ^[6].

- (3) Applicability to carbon sink data financialization: Agricultural carbon sink data (such as soil carbon storage increased by conservation tillage) requires long-term monitoring and certification, and individuals cannot afford the costs. The trust manages carbon sink data, connects to the carbon trading market, and ensures data authenticity and audit compliance. Carbon proceeds are distributed to farmers based on their land area ^[7].

4.2. Policy preparations for establishing data trusts for agriculture, rural areas, and farmer-related data assets

- (1) Legal framework: Clarify the separation of data ownership, right to use, and right to benefit in trust contracts (e.g., farmers retain ownership while trusts obtain operating rights). Compliance must adhere to the Trust Law and Data Security Law, particularly regarding restrictions on cross-border data flows.
- (2) Technical support: Blockchain: Records data contributions and profit distribution to ensure transparency (e.g., on-chain certification via Hyperledger Fabric). Privacy Computing: Enables “data available but not visible” through federated learning and multi-party computation (MPC).
- (3) Benefit distribution mechanism: Dynamic profit sharing, with distribution ratios adjusted based on data usage frequency and derivative value (e.g., remote sensing data used for insurance pricing versus breeding research).
- (4) Incentive mechanism: Farmers who continuously contribute data can obtain additional benefits (such as free agricultural technical services) ^[8]. The data trust model is most suitable for the agricultural data financialization path that requires large-scale integration, long-term operation, and multi-party participation, especially in the fields of securitization, shared transactions, pledge financing, and carbon sink data. Its core value lies in addressing the pain points of agricultural data being “scattered, small-scale, and weak” through neutrality, compliance, and sustainability, thereby maximizing the value of data assets ^[9].

5. Recommendations on the phased advancement of agricultural, rural, and farmer (ARF) data trust

5.1. Gradually realize the regularization of ARF data trust

Establish pilot projects for three models, digital villages, large farms, and smallholder farmers, between 2024 and 2025; banks shall allow the inclusion of data trust shares in the scope of “two rights” mortgage loans in pilot areas. Revise the Trust Law between 2026 and 2027 to add a special chapter on “data trust”; promote the Shanghai Stock Exchange to issue the first agricultural data ABS, such as the “Longping High-Tech Seed Industry Data Trust Beneficiary Certificate.” After 2028, a normalized three-level system of “county-level data trust cooperative - provincial-level data asset exchange - national carbon sink data network will gradually be formed.”

5.2. Optimize trust products

In the design of trust products, variable distribution ratios shall be formulated based on the needs of different

farmers to meet their cash flow requirements. Meanwhile, farmers can obtain real-time updates on the latest market trends and financing status through this platform, making digital financial service information more open and transparent. In addition, integrating blockchain technology into the system helps address the difficulty of altering transactions and enhances public credibility.

5.3. Practice the concepts of green finance and sustainable development

In the future, against the backdrop of the development of big data and artificial intelligence, credit rating and risk management will be empowered by more data, enabling more intelligent rating and risk early warning. Therefore, improving data utilization efficiency, strengthening risk management, and expanding business coverage are key priorities. We advocate that all departments and front-line employees actively explore new cooperation models, such as integrating environmental finance and green finance into rural revitalization development models, to advance agricultural supply-side structural reform and transformation and upgrading ^[10].

6. Conclusion

With the continuous advancement of China's rural revitalization strategy, relying on agricultural, rural, and farmers (hereafter referred to as "three rural issues") data resources to solve problems has increasingly become a new approach. In recent years, as data has emerged as a new factor of production, users have increasingly gained the ability to apply and exploit it, granting data the opportunity to be financialized. This process of financialization can not only improve the efficiency of capital resource utilization but also help realize the transformation and development of rural economic formats and boost the process of agricultural modernization ^[11].

Traditional agricultural production models are facing enormous pressure due to challenges such as insufficient funds, information asymmetry, and market uncertainty. However, financial models such as trusts can provide more financial resources for agricultural production. As a comprehensive and flexible financial model, trusts can invest in agricultural projects by establishing trust funds, thereby promoting the circulation and value increment of rural assets ^[12]. The financialization of "three rural issues" data requires accurate collection and processing. It is necessary to establish intelligent data collection and analysis systems, and use advanced technologies such as big data and cloud computing to sort out data related to agricultural production, operation, and management, thereby forming basic data for investment decision-making ^[13]. Such data not only improves the transparency of agricultural products but also enables financial institutions to more accurately evaluate the risks and returns of agricultural projects, thereby reducing loan costs ^[14].

The policy context is also a key factor driving the financialization of "three rural issues" data. A series of policies issued by the state, such as the reduction or exemption of agricultural loan handling fees and support for rural financial institutions, have greatly promoted the tilt of financial resources toward the "three rural issues" field. The combination of policy guidance, financial innovation, and market demand has effectively addressed the issue of insufficient rural credit and provided new impetus for agricultural development ^[15].

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