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Innovative Research on the Integration of Big Data Technology in Poverty Recurrence Monitoring and Agricultural Product Sales Systems

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Abstract: With the advancement of the rural revitalization strategy, preventing poverty recurrence among previously impoverished populations has become a crucial social concern. The application of big data technology in poverty recurrence monitoring and agricultural product sales systems can effectively enhance precise identification and early warning capabilities, promoting the sustainable development of rural economies. This paper explores the application of big data technology in poverty recurrence monitoring, analyzes its innovative integration with agricultural product sales systems, and proposes an intelligent monitoring and sales platform model based on big data, aiming to provide a reference for relevant policy formulation.

Keywords: Big data technology; Poverty recurrence monitoring; Agricultural product sales; Intelligent early warning; Rural revitalization

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1. Introduction

In recent years, the government has implemented a series of targeted poverty alleviation policies, enabling a large number of impoverished populations to successfully escape poverty. However, some previously impoverished households still face the risk of poverty recurrence. Factors such as market fluctuations, natural disasters, and health issues may lead to a decline in income levels. Therefore, establishing an efficient poverty recurrence monitoring system is crucial for consolidating poverty alleviation achievements and achieving rural revitalization.

At the same time, agricultural product sales play a key role in increasing farmers' income and are closely related to poverty prevention efforts. However, the current agricultural product sales system still faces challenges such as information asymmetry, limited sales channels, and high distribution costs. These issues result in unsold or underpriced agricultural products, leading to income declines for some farmers and exacerbating the risk of poverty recurrence. Enhancing agricultural product circulation efficiency and increasing farmers' income have

become urgent issues that need to be addressed.

The rapid development of big data technology presents new opportunities for precise monitoring and intelligent sales. Through big data analysis, governments can establish accurate poverty recurrence monitoring systems, enabling dynamic identification and early warning. Simultaneously, agricultural product sales can leverage big data to optimize supply-demand matching, enhance market responsiveness, and drive industrial upgrading. This paper explores the application of big data technology in poverty recurrence monitoring, analyzes its innovative integration with agricultural product sales systems, and proposes an intelligent monitoring and sales platform model based on big data, aiming to provide a reference for policy formulation.

The main contributions of this paper are as follows:

(1) A systematic review of the bottlenecks in poverty recurrence monitoring and agricultural product sales systems;

(2) An analysis of the innovative applications of big data technology in poverty risk identification, early warning mechanisms, targeted assistance, and intelligent sales;

(3) The proposal of a collaborative platform model for poverty recurrence monitoring and agricultural product sales based on big data, along with practical policy recommendations.

To better understand the current challenges and future trends in poverty recurrence monitoring and agricultural product sales systems, the next section will analyze the existing bottlenecks and explore potential development directions.

2. Bottlenecks and development trends in poverty recurrence monitoring and agricultural product sales systems

2.1. Bottlenecks in poverty recurrence monitoring and agricultural product sales systems

Despite efforts by local governments to strengthen poverty prevention through dynamic monitoring and policy coordination, the current system still faces numerous challenges. In some regions, the lack of public health awareness results in a high risk of poverty recurrence due to illness. Additionally, outdated data collection methods, delayed updates, and severe information silos hinder the precision of policy implementation.

Agricultural product sales also encounter significant issues. Many farmers lack market forecasting abilities, leading to blind planting or breeding decisions, where the paradox of “difficult selling” and “high purchasing costs” coexist. Furthermore, the complex distribution process, high logistics costs, limited sales channels, and weak brand development make it difficult to establish stable market competitiveness.

2.2. Development trends in poverty recurrence monitoring and agricultural product sales systems

The *2021 No. 1 Central Document* emphasized the use of digital tools to enhance rural governance efficiency [1]. In the future, poverty recurrence monitoring will become more intelligent, leveraging big data and AI for precise early warnings, dynamic identification of high-risk groups, and personalized assistance programs.

Agricultural product sales will advance toward digitalization and diversification, with emerging models such as e-commerce and livestream selling reducing intermediaries and increasing farmers’ income (**Figure 1**). Meanwhile, blockchain technology can establish a reliable traceability system, strengthening consumer trust and promoting agricultural branding.

Furthermore, the coordinated development of poverty recurrence monitoring and agricultural product sales

systems will create an integrated industry cycle. By leveraging big data to match supply and demand, market structures can be optimized, reducing the risk of unsold products. Governments and financial institutions can use data-driven insights to support agricultural loans, insurance, and other financial services, enhancing farmers' resilience to risks and accelerating rural industrial upgrades.

The deep application of big data is reshaping both poverty recurrence monitoring and agricultural product sales systems. The following section will explore its specific applications in poverty recurrence monitoring.

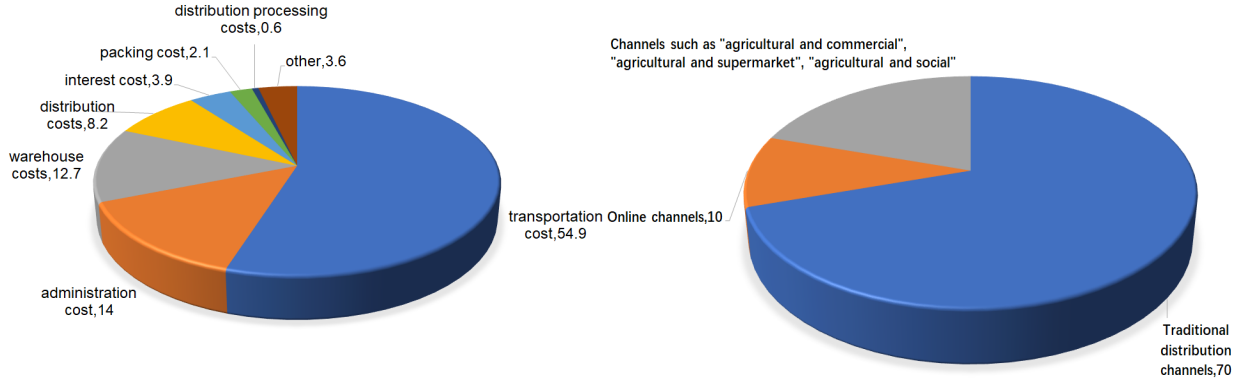

Figure 1. Analysis chart of agricultural products circulation cost composition and distribution of circulation channels (unit: %)

3. Application of big data technology in poverty recurrence monitoring

3.1. Data collection and integration

Poverty recurrence monitoring relies on multidimensional data, including government assistance records, household income, market prices, and meteorological data. Big data technology can integrate multi-source heterogeneous data, enhancing the accuracy and timeliness of monitoring. For example, Guizhou Province has utilized blockchain technology to break down data barriers between the poverty alleviation office, banks, and insurance institutions, ensuring transparency in credit records and medical reimbursement data while reducing fraud risks [2].

3.2. Precision assistance decision support

Big data analytics enable governments to implement personalized assistance measures, such as low-interest loans, skills training, and market expansion. In 2023, a county in Hebei Province discovered that impoverished households relied more on animal husbandry. Consequently, it adjusted support funds to establish a cattle and sheep epidemic prevention center, benefiting 2,000 farming households [3]. Data-driven precision assistance helps enhance the resilience of poverty-alleviated groups against risks.

3.3. Geospatial analysis

GIS technology combined with big data can accurately identify high-risk areas for poverty recurrence. For instance, overlaying historical disaster data with poverty distribution maps can pinpoint regions vulnerable to natural disasters. Additionally, analyzing the distance between impoverished households and public facilities helps identify "service blind spots," providing a basis for infrastructure development.

The application of big data technology has significantly enhanced the intelligence level of poverty recurrence

monitoring. Next, we will explore its innovative applications in agricultural product sales systems to further promote rural economic development.

4. Innovations in agricultural product sales systems

4.1. Big data-driven market matching

Big data analysis can optimize supply-demand matching for agricultural products, reducing the risk of unsold goods. For example, Inspur Cloud's "HaiRuo Agricultural Model" in Beijing integrates data to provide optimized recommendations for the fishing industry, increasing annual output value by over 20% [4]. This intelligent matching improves sales efficiency and reduces market risks.

4.2. Blockchain technology for traceability assurance

Blockchain technology ensures agricultural product quality and traceability, enhancing consumer trust. JD Farm collaborated with Wuchang Rice to launch a traceability system where consumers can scan a QR code to access product information, resulting in a 90% decrease in counterfeit complaints [5]. This strengthens brand credibility and product management standards.

4.3. Integration of e-commerce and livestream selling

Livestream e-commerce has emerged as a new sales model, shortening distribution channels and increasing profits. For example, Kuaishou's "Village Broadcast Program" trains farmers as livestream hosts. A fruit farmer in Sichuan sold mangoes via livestream, achieving a single-day transaction volume of 1.2 million yuan [4]. Livestreaming expands sales channels and enhances farmers' market adaptability.

The combination of big data, blockchain, and e-commerce models is driving innovations in agricultural product sales. Next, we will discuss policy recommendations to accelerate the adoption of these technologies.

5. Policy recommendations for big data-driven poverty recurrence monitoring and agricultural product sales systems

5.1. Technology promotion, talent development, and data-sharing mechanisms

The government should increase efforts to promote the application of big data technology in poverty recurrence monitoring in impoverished areas. Special funds should be allocated for the development of intelligent analysis and early warning systems, including both hardware and software construction. Additionally, training programs should be organized for grassroots poverty alleviation officials and relevant personnel to enhance their proficiency in big data tools, improving monitoring accuracy and efficiency.

Furthermore, efforts should be made to build cross-departmental and cross-regional data-sharing platforms that integrate information from civil affairs, agriculture, and meteorology departments, providing comprehensive support for poverty recurrence monitoring. Collaboration between the government, social institutions, and research institutions should be strengthened to conduct joint studies on poverty recurrence risks and optimize monitoring models, driving continuous innovation and application of big data technology.

5.2. Technology support, platform development, brand building, and market expansion

For enterprises and farmers leveraging big data and blockchain technology to improve agricultural product

sales, the government should provide policy subsidies and tax incentives to encourage the adoption of advanced technologies. Support should be given to the development of a unified agricultural e-commerce platform, the standardization of livestream selling processes, and the provision of technical training and livestreaming guidance for farmers to reduce operational costs and enhance sales effectiveness.

Additionally, a dedicated fund for agricultural product branding should be established to help farmers and enterprises use big data analytics for precise market positioning and brand development. Collaboration with e-commerce platforms and retail chains should be strengthened to expand sales channels. Organizing agricultural product trade fairs can also increase market visibility and competitiveness.

By strengthening technology promotion, talent development, and policy support, the adoption of big data technology in poverty recurrence monitoring and agricultural product sales systems can be accelerated, providing strong support for rural revitalization and poverty alleviation efforts.

6. Conclusion and outlook

The integration of big data and blockchain technology provides innovative solutions for poverty recurrence monitoring and agricultural product sales systems, effectively addressing the issues of delayed monitoring and inefficient agricultural distribution. By establishing a reliable data ecosystem, these technologies can reduce rural financial risk premiums by 20–30% while increasing the price premium of agricultural products by over 15%. The application of big data technology has facilitated the intelligent transformation of targeted poverty alleviation and agricultural product sales, further advancing the implementation of the rural revitalization strategy.

Looking ahead, with the continuous development of emerging technologies such as artificial intelligence and blockchain, poverty recurrence monitoring and agricultural product sales systems will become even more intelligent and efficient. Governments should strengthen policy support, encourage active participation from technology enterprises and research institutions, and promote public-private partnerships to create a sustainable and collaborative ecosystem. Through multi-stakeholder cooperation, rural economies are expected to achieve higher-quality growth, providing strong support for consolidating poverty alleviation achievements and advancing rural revitalization.

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Disclosure statement

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