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Research on the Mechanism and Path of Digital Economy Empowering the Development of Guangxi's Whole Agricultural Industry Chain

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Abstract: The paper looks at how the digital economy can boost Guangxi's agricultural industry and suggests ways to do this. Firstly, it looks at the background and importance of the research, including the role of the digital economy in agriculture and what Guangxi needs. Then, it reviews relevant international research on the digital economy and agriculture to provide a theoretical basis for future research. The study looks at the current situation and challenges in the digital economy, with a view to advancing Guangxi's agriculture. It also looks at the reasons for these challenges. Finally, it sets out a proposed mechanism and pathway for the digital economy to advance Guangxi's agriculture. This strategy includes a range of initiatives, such as improving top-level design, refining digital infrastructure, cultivating smart agriculture, promoting digital transformation in production, creating speciality agricultural brands, digitalising agricultural product marketing, and integrating rural industries. It also calls for the combined development of rural primary, secondary, and tertiary industries.

Keywords: Digital Economy; the Entire Agricultural Industry Chain; Mechanism and Path

1. Introduction

1.1 Research Background and Significance

The digital economy has demonstrated considerable potential in promoting the development of the entire agricultural industry chain, given its rapid development. Guangxi, an important agricultural province in south-west China, is characterised by abundant agricultural resources and distinctive geographical advantages. However, how to effectively use digital technology to empower the entire agricultural industry chain and promote the high-quality development of Guangxi agriculture has become an urgent problem to be solved at present [1].

At present, domestic and foreign research on digital economy and agricultural development has achieved certain results, but there are relatively few studies on specific regions such as Guangxi. Therefore, The present study has been designed to provide a comprehensive exploration of the manner in which the digital economy is contributing to the advancement of Guangxi's agricultural industry chain in its entirety. It is imperative to acknowledge the pivotal role this development plays in Guangxi's agricultural transformation and upgrading., but also provides lessons for other regions [2].

The significance of the research lies in: first, it provides theoretical support and practical guidance for the digital transformation of agriculture in Guangxi and even the whole country; second, it analyzes the current situation and problems of the digital economy empowering the entire agricultural industry chain, and puts forward targeted countermeasures and suggestions to provide reference for government decision-making; Third, promote the optimization and upgrading of rural economic structure, assist the implementation of rural revitalization strategies, and improve farmers 'income levels and quality of life.

In conclusion, the present study has made a significant contribution to the theoretical research in the field of integrated development of digital economy and agriculture. Furthermore, the study has considerable practical value in the formulation and implementation of policy, and it is conducive to the sustainable and healthy development of agriculture in Guangxi and even the whole country.

1.2 Domestic and Foreign Research Review

Globally, Academia and policymakers are focusing on the impact of the digital economy on

agriculture. Foreign research shows that the digital economy has significantly promoted agricultural development by improving efficiency, optimising resource allocation and enhancing competitiveness. For example, the United States and European countries have used technologies such as big data and cloud computing to achieve precise management and efficient operations of agricultural production.

In China, with the advancement of the "Internet +" strategy, the digital economy is becoming increasingly widely used in the agricultural field. Many scholars and institutions have begun to explore how to use digital technology to empower the entire agricultural industry chain to promote agricultural modernization and rural economic development. Specific to Guangxi, due to its unique geographical location and rich agricultural resources, the application of digital economy here has special significance and challenges.

Table 1. Applications of Digital Economy in Agriculture

Year	research	topics main findings
2018	Smart agricultural technology application	Improved crop yield and quality
2019	the development of agricultural	products e-commerce increased farmers 'income
2020	digital infrastructure construction	Promote information flow and resource sharing

The data and Table 1 show initial results from applying the digital economy to agriculture, especially in smart tech and e-commerce. To fully empower the digital economy, we must also solve the problems of inadequate infrastructure and uneven tech application. Research should focus on enhancing the digital economy's impact through innovation and policy support.

1.3 Research Contents and Methods

The objective of this study is to comprehensively examine the manner in which the digital economy fosters the advancement of Guangxi's agricultural industry chain in its entirety, whilst concomitantly conducting a thorough analysis of the underlying mechanisms and pathways through which it accomplishes this. The research content covers the basic concepts of the digital economy, the definition of the entire agricultural industry chain and its development status and problems in the context of the digital economy. It also includes empirical analysis based on the specific situation of Guangxi.

The research method employed a combination of a literature review and case analysis. A comprehensive review of the extant literature was undertaken, encompassing both domestic and foreign research results on the development of the digital economy and the entire agricultural industry chain. This review was conducted with a view to providing theoretical support and research perspectives for the present study. Concurrently, a select number of representative cases are subjected to rigorous in-depth analysis, with the objective of attaining a more nuanced and comprehensive understanding.

Furthermore, the present study will utilise quantitative analysis methods to collect relevant data, and employ statistical software to process and analyse the data in order to reveal the specific manifestations and internal mechanisms of the impact of the digital economy on the development of Guangxi's entire agricultural industry chain.

It is imperative to acknowledge the necessity of meticulous scrutiny during the research process, with a particular emphasis on the application status of the digital economy within the comprehensive agricultural industry chain of Guangxi. This entails a comprehensive evaluation of digital infrastructure development, the implementation of smart agricultural technology, the establishment of agricultural product brands, and the integration of rural industries. Through in-depth analysis of these issues, effective paths and strategies to promote the development of Guangxi's entire agricultural industry chain are proposed.

To summarise, the present study will undertake a comprehensive analysis of the current situation, problems and causes of the digital economy. The aim is to empower the development of Guangxi's entire agricultural industry chain through multi-angle and multi-level research methods. explore effective mechanisms and paths for Guangxi and even The digital transformation of agriculture across the country provides theoretical support and practical guidance [3].

1.4 Innovation Point of the Paper

The following innovative aspects are proposed in this research in relation to the mechanism and path for the digital economy to empower the development of Guangxi's entire agricultural

industry chain:

This study represents a pioneering endeavour in combining the digital economy with the development of the entire agricultural industry chain, thereby facilitating an unprecedented exploration of the interaction between the two and its impact on agricultural development in Guangxi. A comprehensive investigation into the digital economy's enabling mechanisms has yielded novel perspectives and strategies for agricultural transformation and upgrading in Guangxi and other regions of China.

Theorically, this paper defines the concepts of digital economy and the entire agricultural industry chain, and also builds a new theoretical framework to explain how the digital economy promotes the development of the entire agricultural industry chain through technological innovation, model innovation, etc. This theoretical framework addresses the existing research gaps and provides a theoretical basis for subsequent related research.

In terms of empirical analysis, based on Guangxi's specific situation, this study conducted a detailed investigation of the current development of Guangxi's entire agricultural industry chain under the empowerment of the digital economy, and identified the main problems and their reasons. Through empirical analysis, this paper proposes a series of targeted solutions, and these suggestions are of great value in guiding practice.

Finally, this study proposes specific paths for the digital economy to empower the development of Guangxi's entire agricultural industry chain from the aspects of strengthening top-level design, improving digital infrastructure construction, developing smart agriculture, creating specialty agricultural product brands, and promoting rural industrial integration. These suggestions aim to provide practical guidance for government policymakers, business operators and farmers to promote the sustainable development of agriculture in Guangxi.

To sum up, this study not only provides a new perspective for the combination of digital economy and the entire agricultural industry chain theoretically, but also provides specific strategies and suggestions for agricultural development in Guangxi and even other regions on a practical level.

2. The Theoretical Basis for the Digital Economy to Empower the Development of the Entire Agricultural Industry Chain

2.1 Definition of the Concept of Digital Economy

The digital economy is an economic form based on digital technology and modern information technology. It includes e-commerce, electronic payments and online services, as well as digital transformation in agriculture, manufacturing and services.

The digital economy's core characteristics are:

Informatization: the production, dissemination, storage and application of information is the cornerstone of the digital economy. Information is an important resource driving economic growth, and its efficient flow and utilisation are the key to its development.

Networking: the Internet is the main carrier of the digital economy. It promotes the rapid dissemination of information and the global allocation of resources, breaking down the limitations of time and space, and realising the globalisation of economic activities.

Intelligence: The digital economy is enabled by advanced technologies such as artificial intelligence and big data analysis, which facilitate the processing and analysis of voluminous data sets, thereby providing a scientific foundation for decision-making processes and enhancing efficiency and precision.Integration: The profound interpenetration of the digital economy and conventional industries has catalysed the optimisation and enhancement of the industrial structure, giving rise to novel business models and formats.

Openness: The development of the digital economy is contingent on an open data environment and shared platforms, which in turn encourage cross-border cooperation and resource sharing, thereby establishing an open collaborative innovation ecosystem.

The advent of the digital economy has precipitated a paradigm shift in human behaviour, whilst concurrently exerting a profound influence on the economic development paradigm. Indeed, it has become an instrumental agent in the promotion of global economic transformation and growth.

2.2 Concept Definition of the Entire Agricultural Industry Chain

The agricultural industry chain covers all aspects of production, processing, storage, transportation,

sales and services of agricultural products. It now includes multiple links, such as product processing, logistics and distribution, and market sales, forming an interconnected and mutually reinforcing system [4].

In the digital economy era, the agricultural industry chain has expanded to include the application of information technology in all aspects. For example, the Internet of Things is used to monitor crop growth and optimise agricultural processes, while e-commerce platforms are used to sell agricultural products. These technologies improve efficiency and competitiveness.

Collaboration is also important for the agricultural industry chain. This requires information exchange, resource sharing and joint responses to market changes. The digital economy enables this model to be more efficient and flexible, responding quickly to market demand and promoting the development of the agricultural industry chain.

2.3 The Theoretical Basis for the Digital Economy to Empower the Development of the Entire Agricultural Industry Chain

The digital economy has been demonstrated to facilitate the advancement of the agricultural industry chain in its entirety, constituting a novel phenomenon that has emerged from the profound integration of information technology and traditional industries. This process encompasses not only technological innovation, but also the comprehensive optimisation of business models. management methods and industrial chain structure. In theory, it can be summarized into the following aspects [5].

Information asymmetry theory: In the traditional agricultural industrial chain, due to poor and asymmetric information transmission, resource allocation efficiency is low. Through technical means such as big data and cloud computing, the digital economy can effectively reduce information asymmetry and improve resource allocation efficiency.

Theory of network externalities: The evolution of the digital economy has facilitated enhanced connectivity among agricultural producers, processors, and sellers, thereby establishing a networked industrial chain. The network externality effect has been demonstrated to enhance the synergy and competitiveness of the entire industrial chain.

Innovation diffusion theory: The digital economy provides a novel innovation platform and tools for the entire agricultural industry chain, accelerating the spread of new technologies and new models. For instance, the Internet platform has the capacity to expedite the dissemination of novel agricultural technologies on a global scale.

Value creation theory: The digital economy has created new value growth points for the entire agricultural industry chain by optimizing resource allocation, improving production efficiency, and expanding market channels. It can be expressed in mathematical formula as:

$$V=f(X,Y)$$

Among them, V represents value creation, X represents the application of digital technology, and Y represents the optimization of each link in the industrial chain.

To sum up, the theoretical basis for the digital economy to empower the development of the entire agricultural industry chain covers multiple dimensions such as information asymmetry, network externalities, innovation diffusion, and value creation. These theories provide an important analytical framework for understanding how the digital economy promotes the development of the entire agricultural industry chain.

3. The Current Situation and Problems of the Digital Economy Empowering the Development of Guangxi's Entire Agricultural Industry Chain

3.1 The Status Quo of the Digital Economy Empowering the Development of Guangxi's Entire Agricultural Industry Chain

In recent years, with the rapid development of the digital economy, the development of Guangxi's entire agricultural industry chain has also ushered in new opportunities and challenges. The advent of the digital economy has precipitated profound transformations in the agricultural sector of Guangxi, with the implementation of data-driven decision support systems playing a pivotal role in this evolution, intelligent production tools, and efficient market connectivity [6].

In the context of Guangxi, the application of the digital economy is primarily concentrated in the following domains: Firstly, the concept of intelligent agricultural production is introduced, which is defined as the real-time monitoring and management of the crop growth environment

through the utilisation of the Internet of Things (IoT) technology. Secondly, the digitalisation of agricultural product processing is outlined,using big data analysis to optimize processing processes, improve product quality and added value; third, networked agricultural product sales, expanding sales channels through e-commerce platforms and social media, and enhancing brand influence [7].

Table 2. The Promotion of Digital Economy on Guangxi's Entire Agricultural Industry Chain

year	Total agricultural output value (100 million yuan)	Digital technology application coverage (%)
2018	1200	30
2019	1350	45
2020	1500	60
2021	1700	75

It can be seen from the table 2 that as the coverage of digital technology applications increases year by year, Guangxi's total agricultural output value is also growing steadily. This shows that the digital economy is gradually playing an important role in promoting Guangxi's entire agricultural industry chain.

Overall, the application of digital economy in Guangxi's entire agricultural industry chain has achieved certain results, but it still faces problems such as uneven technology popularization and insufficient digital skills of farmers. In the future, policy support and technical training need to be further strengthened to promote the deep integration of the digital economy and Guangxi agriculture and achieve sustainable development [8].

3.2 Problems Existing in the Development of Guangxi's Entire Agricultural Industry Chain Empowered by the Digital Economy

In the process of the digital economy empowering the development of Guangxi's entire agricultural industry chain, there are some significant problems. These problems are mainly reflected in the aspects of insufficient digital infrastructure construction, slow agricultural digital transformation, single agricultural product marketing channels, and low integration of rural industries [9].

Digital infrastructure construction is considered to be of fundamental importance in the development of the digital economy. However, in some rural areas of Guangxi, network coverage is incomplete and Internet access is slow, which directly affects the efficiency of obtaining and disseminating agricultural information. In addition, in terms of agricultural digital transformation, due to the lack of sufficient technical support and professional talents, it is difficult for many traditional agricultural enterprises to achieve effective digital transformation [10].

The single marketing channel for agricultural products is also an important factor restricting the development of agriculture in Guangxi. At present, most agricultural products still rely on traditional offline sales channels and lack effective online marketing strategies, which leads to limited market expansion and inability to fully utilize the opportunities brought by the digital economy.

The low degree of integration of rural industries limits the extension of the industrial chain and the improvement of value. Although Guangxi has abundant agricultural resources, due to the insufficient industrial chain, the synergy between upstream and downstream industries is not obvious, which affects the improvement of overall economic benefits.

The following table 3 shows some key indicators of Guangxi's agricultural digital transformation, reflecting current problems:

Table 3. Key Indicators of Guangxi's Agricultural Digital Transformation

indicators	present situation	Target value
Network coverage (%)	65	90
Number of digital transformation enterprises (home)	120	300
Proportion of online marketing channels (%)	20	50
Industrial integration (%)	40	70

Guangxi faces challenges in developing its agricultural industry using the digital economy. It must promote the province by strengthening digital infrastructure, accelerating the digital transformation of agriculture, broadening agricultural product marketing channels and integrating rural industries.

3.3 Analysis of the Causes of the Problems that Digital Economy Empowers the Development of Guangxi's Entire Agricultural Industry Chain

In the process of the digital economy empowering the development of Guangxi's entire agricultural industry chain, there are a

series of problems, and the analysis of the causes of these problems can be discussed from multiple dimensions. The primary problem is insufficient digital infrastructure construction, which directly affects the process of agricultural digital transformation. Secondly, farmers are not highly receptive to new technologies and lack necessary digital skills, which limits the application of digital technology in agricultural production. In addition, agricultural product marketing channels are single and fail to make full use of the advantages of the digital economy for brand building and market expansion. Farmers 'low acceptance of new technologies and lack of digital skills are important reasons for the limited application of digital technology in agricultural production. Solving this problem requires the joint efforts of the government, enterprises and farmers to improve farmers 'digital literacy through training and education, and at the same time provide technical support and policy guidance to promote the widespread application of digital technology in the agricultural field.

4. Mechanisms and Paths for the Digital Economy to Empower the Development of Guangxi's Entire Agricultural Industry Chain

4.1 The Mechanism for Digital Economy to Empower the Development of Guangxi's Entire Agricultural Industry Chain

The digital economy has played a significant role in promoting the development of Guangxi's entire agricultural industry chain by providing efficient data processing and information sharing platforms. This process is mainly achieved through the following mechanisms [11]:

Data-driven decision support system: Use big data analysis technology to collect and analyze multi-dimensional data such as agricultural production and market sales to provide scientific decision-making basis for agricultural producers and managers. For example, by analyzing historical climate data and crop growth cycles, optimal sowing and harvest times can be predicted.

Supply chain optimization: Through digital means, realize full-process management from agricultural product production to sales and improve the transparency and efficiency of the supply chain. This includes using blockchain technology to track the source and flow of agricultural products and ensure food safety.

Marketing innovation: Use the Internet and social media platforms to expand sales channels for agricultural products and increase market exposure of products. At the same time, through data analysis, we understand consumer preferences and guide product development and market positioning.

Policy and financial support: By formulating relevant policies and providing financial subsidies, the government encourages enterprises to invest in digital infrastructure construction, such as 5G networks, cloud computing centers, etc., to provide the necessary material foundation for agricultural digital transformation.

4.2 Strengthen Top-level Design and Improve Digital Infrastructure Construction

In the era of digital economy, strengthening top-level design and improving digital infrastructure construction are key steps in promoting the development of Guangxi's entire agricultural industry chain. This not only involves the upgrading of technology, but also includes policy formulation, capital investment, and talent training[12].

First, the government should introduce relevant policies to clarify the goals and standards for digital infrastructure construction. These policies need to cover network coverage, data center construction, cloud computing services and other aspects to ensure that all links in the agricultural industry chain can enjoy high-quality digital services[13].

Secondly, increasing capital investment is indispensable. The government can encourage enterprises and individuals to invest in digital infrastructure construction by setting up special funds and providing financial subsidies. In addition, more social capital participation can be attracted through the public-private partnership (PPP) model.

Thirdly, talent training is also an important part in improving the level of digital infrastructure construction. Universities and vocational training institutions should offer relevant courses to cultivate a group of compound talents who understand both technology and management.

4.3 Develop Smart Agriculture and Promote the Digital Transformation of Agricultural Production

In the context of the digital economy, the

development of smart agriculture is a pivotal step in realising the digital transformation of agricultural production. Smart agriculture is defined as the intelligent management of agricultural production processes through the integration of modern information technologies, including the Internet of Things, big data, and cloud computing. The primary benefits of smart agriculture include enhanced agricultural production efficiency and improved product quality.

The core of smart agriculture lies in the collection, analysis and application of data. By installing various sensors in farmland, such as soil moisture sensors, meteorological stations, etc., the crop growth environment can be monitored in real time and provided farmers with scientific planting decision support. In addition, the use of drones for crop monitoring and pest control can not only reduce labor costs, but also improve operation accuracy and efficiency.

4.4 Create Characteristic Agricultural Product Brands and Realize Digitalization of Agricultural Product Marketing

In the era of digital economy, creating specialty agricultural product brands and realizing digitalization of marketing are key strategies to enhance Guangxi's agricultural competitiveness. By using digital technology, we can effectively enhance the brand value of agricultural products, broaden sales channels, and increase farmers 'income.

First of all, establishing a comprehensive agricultural product information database is the foundation. This database not only includes basic information about products, such as origin, quality, nutritional value, etc., but also includes consumer feedback and market trend analysis. This can help producers better understand market demand and adjust production strategies.

Next, use social media and e-commerce platforms for brand promotion and sales. Through these platforms, agricultural products can be directly displayed to potential consumers, and consumer purchasing behavior data can be collected to provide a basis for subsequent product improvements and market strategies.

4.5 Promote the Integration of Rural Industries and Promote the Integrated Development of Rural Primary, Secondary and Tertiary Industries

In the context of the digital economy, the industrial upgrading and transformation of Guangxi's agriculture must be achieved through the deep integration of rural industries. The integrated development of rural primary, secondary and tertiary industries has the potential to enhance the overall competitiveness of agriculture, as well as effectively promoting the development of the local economy.

The term 'rural primary industry' is used to denote traditional agricultural production activities, including planting and breeding. Secondary industry pertains to the processing and manufacturing of agricultural products, including food processing and textile production. The tertiary industry is defined as comprising agriculture-related service industries, including agricultural product sales, rural tourism, and agricultural information services, amongst others.

In order to more intuitively show the current situation of the integrated development of rural primary, secondary and tertiary industries, the following is a data table on the integration of rural industries in a certain area of Guangxi:

Table 4. Data Table of Rural Industrial Integration in a Certain Area in Guangxi

year	Output value of primary industry (100 million yuan)	Output value of secondary industry (100 million yuan))	Output value of tertiary industries (100 million yuan)
2018	120	80	50
2019	130	90	60
2020	140	100	70

It can be seen from the above table 4 that with the growth of the year, the output value of the primary, secondary and tertiary industries in rural Guangxi has increased, especially the rapid growth rate of the tertiary industry, which shows the increasing importance of the service industry in rural economic development.

In conclusion, the promotion of the integration of rural industries, as well as the promotion of the integrated development of rural primary, secondary and tertiary industries, are important ways to realise agricultural modernisation in Guangxi. The comprehensive development of the rural economy can be effectively promoted by strengthening policy support, optimising industrial structure, and improving service functions.

5. Conclusion

The profound empowerment of the digital economy offers a pivotal avenue for the comprehensive enhancement of Guangxi's entire agricultural industry chain. In order to effectively address the current shortage of digital infrastructure and uneven technology application in Guangxi agriculture, it is imperative to enhance top-level design, improve digital infrastructure construction, develop smart agriculture, create specialty agricultural product brands, and realise the digitalisation of marketing. Furthermore, the integration of rural primary, secondary and tertiary industries must be promoted. The following issues must be addressed: balance and others. These mechanisms and paths provide two things. Firstly, they provide theoretical support and practical guidance for the transformation and upgrading of Guangxi's agriculture. Secondly, and equally importantly, they provide experience that can be used for other regions.

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