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Research on Improving Dynamic Adaptation of Supply and Demand of China's Agricultural and Rural Digital Governance

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Abstract

With the rapid development of the Internet, big data and artificial intelligence, the proportion of digital economy in GDP is getting heavier and heavier. Digital technology has become an inexhaustible driving force to promote the development of all walks of life. This paper explores the mechanism of digitalization affecting the development of agricultural villages and the dilemma faced by the current digitalization management of agricultural villages, inquires about the indicators that can represent the digitalization degree of agricultural villages in China in recent ten years and makes relevant analysis, and establishes OLS model. Through the data analysis after linear regression, the accuracy of the model is verified, the impact of digital governance on the high-quality development of rural economy is studied, and a new path to improve the dynamic adaptation model of supply and demand of China's agricultural and rural digital governance is explored, and the corresponding strategies are proposed.

Keywords

Agriculture and rural areas, digital governance, economic growth, dynamic adaptation of supply and demand.

1. Introduction

At present, China has entered a new stage of development. The digital economy based on the Internet, big data, cloud computing and artificial intelligence has brought tremendous impact to the global economy and people's lives. The continuous development of digital technology has had a profound impact on all walks of life, bringing new opportunities and challenges to the further development of agriculture and rural areas. For agriculture and rural areas, digitalization refers to the scientific and efficient integration and analysis of agriculture-related resources and information by means of data mining technology, and the promotion of agricultural economic development and the modernization of rural areas in China by improving the cultural quality of farmers through digital technology. However, despite the rapid development of digital technology, compared with cities, the degree of digitalization in agriculture and rural areas is relatively backward, and there are many deficiencies, such as backward informatization foundation, insufficient integration of rural governance data, imperfect continuous operation mechanism, and low comprehensive quality of governance subjects. For most farmers, the convenience of living and economic growth brought by digital technology are still relatively weak. Improving the dynamic adaptability of supply and demand of digital governance in agriculture and rural areas plays an important role in promoting the development of rural areas, achieving high-quality economic growth and meeting the rapid development needs of digital technology in rural areas.

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2. Literature Review

Cheng MingWang, Zhang Jiaping (2019) obtained the non-linear influence of the Internet on the income of urban and rural residents by means of quantitative analysis. Accelerating the process of digitalization of China's agricultural and rural areas is of great significance in narrowing the income gap between urban and rural areas [1]. Huang Qian, Li Zheng, Xiong Deping (2019) From the perspective of digital finance, the study found that digital finance plays a role in promoting rural economic growth [2]. Yin Haodong, Huo Peng and Wang Sangui (2020) put forward that digital transformation can reduce the inequality of opportunities and capabilities to share digital dividends between urban and rural areas when studying the digital transformation of agricultural and rural areas [3]. Xue Guoqin, Xiang Xinyi (2020) pointed out that the rapid development of agricultural and rural digital economy is not only a great achievement in the construction of rural information infrastructure, but also enhances the urgency of strengthening the construction of rural information infrastructure [4]. Wang Jingfang (2020) believes that if we want to promote the coordinated development of agricultural ecology and agricultural economy, we must increase science and technology to promote ecological agriculture [5]. Qi Wenhao, Zhang Yuejie, Jia Jifa, and Liu Yong (2021) believe that improving the informatization of agriculture and rural areas can promote the integration of urban and rural areas and accelerate the development of rural areas [6]. Baure J M.(2018) concluded that the backwardness of digital technology in agriculture and rural areas has inhibited the economic growth in rural areas [7]. Liu Yong (2021) believes that agricultural information communication can enhance farmers' digital awareness and improve agricultural production.

3. The Influence Mechanism of Digital Governance of Agricultural Countryside on the Development of Agricultural Countryside

Digital technology has created new modes of production and economic models. Innovation has been made in resource allocation, efficiency improvement, sustainable development and other aspects, thus promoting fundamental changes in agricultural production and rural life.

3.1. Digital Governance Adjusts Industrial Structure

Factor endowment theory points out that a country's total factors of production are certain. In our country, due to the differences in development between regions, the factor endowments between regions are also different. The unequal distribution of means of production has slowed down the growth rate of the agricultural economy. However, the average distribution of means of production is not in line with the actual development needs, so the pursuit is the rational distribution of factors of production between different regions. The digital management of agriculture has solved this problem well. The adjustment of industrial structure through digital governance is mainly reflected in changing the investment proportion of agricultural production factors through the big data platform. The sharing of big data platform information can accurately predict the demand of production factors in different regions, and then the production data can be allocated according to needs.

In the production process, digitalization makes the maximum use of land, labor, capital and other elements in agricultural production. On the one hand, by means of digitalization, the coordinated use of various elements can be maintained to reduce the probability of risks in agricultural production and operation. On the other hand, information technology should be infiltrated into each process of agricultural production to control and optimize the allocation of each resource, and rely on information technology to closely link up all aspects of agricultural production, sales and transportation, so as to promote the sustainable growth of agricultural economy on the basis of improving the level of agricultural production and operation.

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3.2. Digital Governance to Improve Production Efficiency

In Marx's labor value theory, labor is divided into simple labor and complex labor. Among them, simple labor is general human labor and complex labor is productive labor with certain skills. Traditional agricultural production belongs to simple labor and mainly depends on manpower. Through digital technology, all links of production, such as planting, irrigation, pesticide application and harvesting, can be handed over to mechanical tools and sensors, thus transforming simple human labor into complex labor with digital technology. In terms of product sales, instead of relying solely on sales in the market, we can directly connect farmers with demanders through big data platforms, open up sales channels for agricultural products, and form a professional logistics and transportation system for agricultural products to reduce the losses caused by asymmetric information to both supply and demand sides of products. It can also enable consumers to meet their own needs in a timely manner.

3.3. Digital Governance Promotes Sustainable Development

In 1987, China first proposed the scientific development concept, which is the economic theory of sustainable development. However, in order to increase the agricultural output and income in the traditional agricultural production, a large number of pesticides and chemical fertilizers have brought huge pollution to the land environment. This production mode is no longer in line with the current concept of sustainable development. Automatic monitoring, intelligent greenhouse and sensor sensing technology supported by information technology such as internet and big data have changed the traditional production mode, greatly reduced the use of chemical products, reduced the waste of resources and environmental pollution, and conform to the concept of sustainable development.

4. The Dilemma Faced by the Digitalization of Agriculture and Countryside

4.1. Inadequate Supply and Demand of Digital Network Services and Inadequate Infrastructure Construction

The geographical location of rural areas is remote and the road traffic is inconvenient, which brings great resistance to the laying of network lines and leads to the low network coverage rate in rural areas. Because the cultural literacy of the rural residents is not high, the degree of demand for the network is low, which reduces the enthusiasm of the network operators to expand their business in rural areas.

In recent years, rural road traffic facilities have received attention, but there are still problems such as small number of rural roads, deterioration of road conditions and insufficient follow-up maintenance. The local express logistics and distribution network is sparse, and there are few express delivery stations. Farmers can only pick up goods at relatively close express points when shopping on the network, and cannot enjoy more convenient express service. The rural roads are steep and complicated, which have high requirements for vehicle selection and route selection. While ensuring the safety of vehicles and carriers, the safety, speed and cost of freight transportation should also be considered. There are also some rural areas that are relatively remote and difficult for logistics companies to cover. Even if the logistics can be reached, the quantity of agricultural products is small and the cost is high, resulting in less revenue for rural e-commerce. These factors hinder the development of local e-commerce and affect the quality development of local economy.

4.2. Supply and Demand of Digital Technicians Do not Match

Due to the lack of capital, information and other factors of production, the domestic digital talent training system is not perfect, the rate of digital talents returning to their hometown is

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low, the existing professional skills training is insufficient, and it is difficult to carry out the digital management of agriculture and rural areas quickly. The revolutionary subversion of the relationship between agricultural production and productive forces by the digital economy has brought unprecedented digital characteristics to modern agricultural production, and has had a huge impact on the traditional production concept of agriculture. However, the subjective initiative of the digital transformation of agricultural producers with low educational level is weak. The shortage of high-quality talents brings great obstacles to the digital management of agriculture and countryside.

4.3. Digital Information Sharing is not Comprehensive

Due to lack of funds and imperfect communication facilities, the ultimate information sharing of agricultural information is in trouble. When big data platforms integrate information, some hidden information cannot be collected, and many information is in a state of drift. The imperfection of the information sharing system makes the information service organizations and personnel engaged in relevant work unable to complete their work in time, and the pace of information sharing is slowed down.

4.4. The Digital Governance System is not Perfect

Undeniably, the digital transformation of agricultural and rural governance has achieved certain results, but the construction of digital governance system is still the weakest link. On the whole, today's local digital governance still stays in the basic links of breaking down data barriers, unblocking information channels and promoting information openness. There are still many obstacles to further dismantling and reforming the traditional governance system and comprehensively enhancing the effectiveness of digital governance. For example, the governance function is not good, the governance cost is too high, the public participation is insufficient, and there is no relevant system guarantee.

5. Build OlS Model

5.1. Variable Selection

The degree of digitalization in agricultural and rural areas can be divided into agricultural digitalization degree and rural digitalization degree.

With the development of digital economy, total agricultural output value is a direct reflection of agricultural digitalization. In agricultural production, the total power of agricultural machinery represents the degree of mechanization. The greater the degree of mechanization, the faster the production, the greater the total agricultural output value and the greater the degree of digitization. Agricultural production cannot be separated from the use of pesticides. Digital technology can accurately control the use of pesticides and reduce the use of pesticides. In addition, the use of digital equipment, such as various production instruments and sensors, cannot be separated from the support of electricity. Rural electricity consumption is also closely related to the total agricultural output value.

The higher the degree of digitalization in the countryside, the more convenient the residents' life will be and the higher the consumption will be. The consumption level of the rural residents reflects the degree of digitalization in the countryside from the side. The development of digitalization cannot be separated from the network, and the rural broadband access users can be taken as the independent variable factors influencing their development. The express delivery industry is also another side reaction to the degree of digitalization in rural areas. The development of the express delivery industry cannot be separated from the development of delivery routes. The shorter the delivery routes, the less time it takes, the higher the satisfaction of the residents, and the faster the development of the industry. It can be taken as another independent variable.

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Table 1. China's Agricultural Output Value and Its Influencing Factors

	PA	X_1	X_2	X_3
2011	40339.62	97734.66	178.7	7139.62
2012	44845.72	102558.96	180.61	7508.46
2013	48943.94	103906.75	180.77	8549.52
2014	51851.12	108056.58	180.33	8884.45
2015	54205.34	111728.07	178.3	9026.92
2016	55659.89	97245.59	174.05	9238.26
2017	58059.76	98783.35	165.51	9524.42
2018	61452.6	100371.74	150.36	9358.54
2019	66066.45	102758.26	139.17	9482.87
2020	71748.23	105622.15	131.28	9717.18

Table 2. Consumption Level of Rural Residents in China and Its Influencing Factors

	CI	Y_1	Y_2
2011	5879.6	3308.8	78667
2012	6573.4	4075.9	95572
2013	7396.6	4737.27	125115
2014	8365	4873.71	137562
2015	9409.2	6398.37	188637
2016	10609	7454.03	216708
2017	12145.3	9377.3	278025
2018	13984.7	11741.67	274635
2019	15382.4	13477.33	318516
2020	16062.6	14189.65	349075

5.2. Establish OLS model

Based on the above data, the model is constructed using the data of the decade 2011-2020.

$$PA=\alpha+\theta 1X1+\theta 2X2+\theta 3X3+\mu 1 \quad (1)$$

$$CI=\beta+N1Y1+N2Y2+\mu 2 \quad (2)$$

PA is the gross agricultural product, X1 is the total power of agricultural machinery, X2 is the amount of pesticide used, X3 is the amount of electricity used in rural areas, 1 is the random error, and 1, 2 and 3 are undetermined coefficients.CI is the consumption level of village residents, Y1 is the number of rural broadband access households, Y2 is the number of kilometers of rural delivery routes, 2 is the random error, and β, N1 and N2 are undetermined coefficients.

According to the results of regression analysis, the values of α, $\theta 1$, $\theta 2$ and $\theta 3$ are 36339.32, 0.167099, -289.5971 and 5.635289, respectively. The P values of their corresponding statistics of T are 0.0128, 0.0900, 0.0000 and 0.0001, respectively. Their numbers are very small, indicating that they all meet the standard of T-test. The P value of F-test is 0.0002 and the value is also very small, indicating that the model also meets the standard of F-test. From Table 2, we can see that the values of β, N1 and N2 are 3044.986, 0.588684 and 0.013808 respectively, and their corresponding P values of T statistics are 0.0000, 0.0012 and 0.0214 respectively. Their numbers are also very small, indicating that they all meet the standard of T test, and the P value

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of F test is 0.0000, indicating that the model also meets the standard of F test. Therefore, the equation is obtained.

$$PA=36339.32+0.167099X1-289.5971X2+5.635289X3 \quad (3)$$

$$CI=3044.986 +0.588684Y1+0.013808Y2 \quad (4)$$

5.3. Regression Analysis

Judging from the operation results of the model, the selected independent variables have a significant impact on the agricultural GDP and the consumption level of rural residents, and have a significant role in promoting the digital governance of agricultural villages. In the aspect of agricultural digital governance, the use of pesticides has the most significant impact on the total agricultural output value among the selected independent variables. Through digital technology, accurate prediction can be made on agricultural production, rational use of pesticides can reduce the use of pesticides and promote sustainable development. In addition, the increase in total power of agricultural machinery and electricity consumption has also stimulated the growth of the agricultural economy and promoted the good development of agricultural digital governance. In the aspect of rural digital governance, digitalization has boosted the consumption level of rural residents, among which the independent variable, rural broadband access users, has the most significant impact on it. In order to achieve comprehensive digital management, the network is the foundation and the most important influencing factor, which provides a new path to improve the degree of digitalization. The increase in business outlets has also brought positive impact on the consumption level of rural residents and improved the level of rural digital governance.

6. Suggestions on Improving Agricultural and Rural Digital Governance

6.1. Strengthen the Construction of Network and Infrastructure

Building network infrastructure is the foundation of digital governance. According to the local conditions, install network broadband and improve the basic transportation and communication system. At the same time, during the period of digital construction, expand the use of satellite transmission network and television and radio, and build a relatively rich agricultural product market information network system, laying a good foundation for the development of agricultural industrialization. Government departments also need to increase their investment in building digital platforms so that farmers can obtain timely and effective information and make production decisions. Special fund projects can be set up to prepare for the future information security vulnerability detection and network security management system construction. The government can take the form of cooperation with internet companies to ease the capital pressure and acquire advanced software production and operation skills and enterprise management experience.

6.2. To Strengthen the Introduction of Technical Personnel and the Cultivation of Farmers' Basic Quality

Digital governance is directly influenced by people with professional skills. In view of the current shortage of human resources, measures can be taken such as raising salaries, introducing human resources and optimizing the system of professional and technical personnel. Regular training can also be conducted for the existing personnel to improve the overall level of the talent team. Actively contact with universities and enterprises, learn more advanced information technology knowledge and concepts through research, and master more comprehensive operation technologies such as computers and networks. At the same time,

regular targeted training and education are provided to employees in different positions. It is necessary for decision-makers and managers of information construction to improve their understanding of local digital construction through experience exchange and academic discussion, and to participate in local digital construction with more positive attitude and confidence; For technical management personnel, regular business training should be carried out, training and assessment should be carried out, and the working ability, professional skills and professional quality of the personnel should be judged; Scientific instructors are required to regularly carry out training activities on cutting-edge knowledge and technology to ensure their value in the promotion of agricultural science and technology.

6.3. Complete the Governance System

In order to promote the rural digital construction, it is necessary to develop and perfect the digital governance system to avoid the waste of resources in the process of digital construction. In this regard, it is necessary to strengthen government control and formulate plans suitable for regional development. In the initial stage of construction, it is necessary to strengthen government intervention, be market-oriented, and actively involve government departments in the construction of digital platforms and personnel training; Explore opportunities for cooperation with enterprises, learn and introduce advanced digital management technology, realize resource sharing, and establish a profit sharing mechanism so that human and material resources needed for digital governance in agriculture and rural areas can be met; Improve the information construction mechanism, implement strict leadership responsibility system and clear division of responsibilities for relevant departments in agriculture and rural areas; In order to realize information sharing and strengthen construction, specific tasks need to be implemented by specific departments and personnel, and coordinated management among departments; In order to make the decision more scientific, a consultation mechanism should be established. Before making decisions, it is necessary to fully understand relevant data and information, summarize information, listen to expert opinions and suggestions, conduct investigations and strive to minimize risks.

7. Tag

With the rapid development of digital economy, all walks of life should keep pace with the times. It is a wise move to combine digital technology with agricultural and rural areas in order to speed up the pace of China's agricultural and rural development and realize the integration of urban and rural areas. But in this process, due to lack of experience, there are many problems. Therefore, it is necessary to combine the actual development of different regions, analyze the various problems faced, and take corresponding measures to promote the high-quality development of agriculture and rural areas.

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