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Analysis of the Mechanisms of Digital Countryside Enabling High-Quality Development of Rural Economy

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Abstract: With the rapid development of information technology, the promotion of digital rural construction in the digital era is conducive to the high-quality development of the rural economy. In contemporary times, the digital countryside strategy has become an important initiative for China's high-quality development and the realization of high-quality development of rural revitalization. Based on the balanced panel data of western China from 2013 to 2022, this paper constructs a comprehensive indicator system containing digital infrastructure construction, economic digitization, governance digitization and life digitization, measures the level of digital countryside development of each province in the western region using the entropy method, and empirically analyzes its impact on the total output value of agriculture, forestry, animal husbandry and fishery using the fixed effect model. The results of the study show that the level of digital village development has a significant positive promotion effect on the total output value of agriculture, forestry, animal husbandry and fishery, and there are differences between different provinces. Specifically, the construction of digital villages effectively enhances the development level of rural economy by improving the efficiency of agricultural production, optimizing industrial structure, enhancing market competitiveness. Further robustness tests use gross domestic product (GDP) as a proxy indicator and the TOPSIS method to reassess the level of digital rural development, and the results all indicate that the conclusion has a high degree of reliability. Based on this, this paper proposes policy recommendations to strengthen the construction of digital infrastructure, enhance farmers' digital literacy, promote the deep integration of digital technology and rural industry, improve the policy support system, and strengthen the regional synergistic development in order to optimize the construction of digital villages, better empower the development of rural economy in the western region, and promote the in-depth implementation of the strategy for revitalization of the countryside.

Keywords: Digital countryside; Entropy method; Fixed effects analysis; High quality development.

1. Introduction

In the current digital era, the rapid development of information technology is profoundly changing various aspects of society, and rural areas are no exception. Digital countryside construction, as an important component of the rural revitalization strategy, has become a key means to promote the modernization of agriculture and rural areas. With the advancement of the global informatization wave, the concept of digital countryside has gradually clarified. Its definition can be summarized as: using digital technology and internet tools to upgrade and transform rural production methods, lifestyles, and governance methods, thereby enhancing agricultural productivity and the quality of life of rural residents, and achieving seamless connectivity between urban and rural information. This process not only involves the intellectualization and precision of agricultural production but also includes the digitization of rural governance and the convenience of public services.

The background of digital countryside construction holds multiple significances. On one hand, it is a positive response to the global informatization wave, aiming to narrow the urban-rural digital divide through digital means and promote the synchronization of rural areas with cities in entering the information age. On the other hand, it is also a practical response to the current "three rural issues" faced by Chinese villages. For a long time, rural areas in China have faced challenges such as slow agricultural transformation and upgrading, and the need to improve the quality of life of farmers. Through digital countryside construction, these issues can be effectively addressed, promoting agricultural modernization and the high-quality development of the rural economy.

In recent years, the Chinese government has attached great importance to digital countryside construction, issuing a series of policy measures to promote its development. For example, the "Digital Countryside Development Strategy Outline" clearly proposes to vigorously develop the rural digital economy, continuously promote the digital transformation of agriculture, and focus on enhancing the high-quality development of the rural economy. Additionally, the "2024 Digital Countryside Development Work Points" issued by the Cyberspace Administration of China and other departments specify specific work goals and tasks, including improving the supply capacity of rural network infrastructure, promoting smart agriculture, and stimulating the vitality of the county digital economy. The implementation of these policies provides strong policy support and guarantees for digital countryside construction.

Although significant progress has been made in digital countryside construction at both the policy and practical levels, the specific impact mechanisms and pathways of its influence on the high-quality development of the rural economy still require further in-depth research. This study aims to explore how digital countryside construction empowers the high-quality development of the rural economy, analyze its impact differences in different regions and industries, and propose corresponding policy recommendations and practical paths.

Specifically, this study will focus on the following aspects: First, what is the overall impact degree of digital countryside construction on the high-quality development of the rural

economy? Second, through what specific pathways and mechanisms does digital countryside construction affect the high-quality development of the rural economy? Third, are there significant differences in the impact of digital countryside construction on the high-quality development of the rural economy under different regional and industrial backgrounds? Fourth, how to optimize digital countryside construction to better empower the high-quality development of the rural economy in western China?

However, in the current digital era, the rapid development of information technology profoundly affects various levels of society, and rural areas are also facing new development opportunities and challenges. Digital countryside construction, as an important part of the rural revitalization strategy, has received widespread attention. The state actively promotes the application of digital technology in rural areas, expecting to use its power to enhance the rural economy, optimize governance, improve the quality of life, and narrow the urban-rural digital divide.

The application of digital technology in agricultural production, rural e-commerce, education, healthcare, and other fields is gradually increasing, injecting new momentum into rural development. However, in the process of practice, digital countryside construction faces many problems. For example, the adaptability of technology application: rural areas in different regions have differences in geographical environment, economic foundation, and cultural habits, and whether digital technology can effectively integrate into local production and lifestyles needs further exploration; imperfect infrastructure construction: issues such as insufficient network coverage and outdated equipment in some rural areas limit the promotion of digital technology; the uneven digital literacy of farmers affects the popularity and application effectiveness of digital technology in rural areas. These realities highlight the necessity of in-depth research on digital countryside construction. Through empirical analysis, a comprehensive understanding of its current situation, effectiveness, and influencing factors can provide a solid scientific basis for subsequent policy formulation and practice optimization, helping digital countryside construction to develop better and thereby promoting comprehensive rural revitalization.

2. Literature Review

2.1. Research on the Measurement of Digital Countryside Construction Level

The measurement of the digital countryside construction level is the basis for understanding its impact on the high-quality development of the rural economy. In recent years, scholars have constructed various indicator systems to measure the level of digital countryside construction. For example, Gao Guixian [1] constructed an evaluation system containing five criterion layers: digital infrastructure, digital industry, digital life, digital governance, and digital ecology, and 25 specific indicators. Zhang Yue et al. [2] used the entropy weight method to quantitatively evaluate the digital countryside construction level of the whole country and various provinces from 2013 to 2022. The study found that the digital countryside construction level at the national level is generally low but shows a clear upward trend, while at the regional level, it shows a gradient distribution pattern of "east-central-west". Zhang Yue et al. constructed an evaluation indicator system from four dimensions: infrastructure, development environment, digital application, and digital governance, analyzing the regional differences and convergence characteristics of the digital countryside construction level. In addition, Zhu Honggen and Chen Hui constructed a comprehensive four-dimensional digital countryside development level indicator system, and deeply analyzed the development heterogeneity of the four major regions from the changes and differences in time, region, and spatial distribution. Liu Qing [4] measured the digital countryside development level score of a certain province based on the dynamic weight of indicators determined by the entropy method, integrating the TOPSIS method, and analyzed the spatiotemporal evolution characteristics and regional differences within a certain region. Zhang Hong [5] et al. evaluated the readiness of digital countryside from five dimensions: macro environment of digital countryside, infrastructure support, information environment, government affairs environment, and application environment. These studies provide various methods and perspectives for scientifically evaluating the digital countryside construction level, but there are also some shortcomings, such as the lack of a unified standard for the construction of the indicator system, and the large differences in measurement methods and results of different studies, leading to certain impacts on the comparability and consistency of the results.

2.2. Research on the Mechanism of Digital Countryside Construction's Impact on High-Quality Development of Rural Economy

The mechanism of digital countryside construction's impact on the high-quality development of the rural economy is another important aspect of academic concern. Research shows that digital countryside construction can affect the high-quality development of the rural economy through various pathways and mechanisms. Lei Zekui et al. [6] explained the internal mechanism of digital countryside construction affecting the high-quality growth of the agricultural economy, and applied a dynamic panel model and a mediation effect model to test the impact effect and action path of digital countryside construction on the high-quality growth of the agricultural economy. They believe that digital countryside construction can promote the high-quality development of the agricultural economy by improving the intellectualization level of agricultural production, promoting the extension and upgrading of the agricultural industry chain, and enhancing the market competitiveness of agriculture. Li Benqing et al. [7] empirically tested the transmission mechanism and regional heterogeneity of digital countryside construction's effect on industrial prosperity from the perspective of industrial revitalization. They pointed out that digital countryside construction can promote the optimization and upgrading of the rural industrial structure, promote the integrated development of primary, secondary, and tertiary industries in rural areas, improve the overall quality and efficiency of rural industries, and thus achieve the goal of industrial prosperity. Li Xiaoyin [8] found that digital countryside construction promotes the high-quality development of agriculture from the perspective of resource misallocation, using a convergence model for testing. Cai Chengzhi [9] used a coupling coordination degree model to measure the coordination level between rural revitalization and new urbanization in western China. The empirical results show that the coordination between the two can be effectively

improved through digital countryside construction. In addition, some scholars believe that digital countryside construction has significant effects on the integrated development of urban and rural areas, the upgrading of consumption in rural areas, and the allocation of financial assets of farmers. These studies reveal the mechanism of digital countryside construction to achieve high-quality development of the rural economy by improving the level of agricultural modernization, promoting the upgrading of the industrial structure in rural areas, and improving the resource utilization rate in rural areas, but the research on the differences of the mechanism under different regional and industrial backgrounds is not deep enough.

2.3. Research on High-Quality Development of Rural Economy in Western China

Western China is an important region for the development of the rural economy in China, and its high-quality development has attracted widespread academic attention. Han Lei et al. [10] measured and compared the rural development process of various regions in China and found that western China is narrowing the gap in rural development with central and eastern China, but the ecological environment is gradually becoming a major constraint on the rural development level in western China. They pointed out that western China has certain advantages in terms of resource endowment and geographical location, but also faces challenges such as fragile ecological environment, lagging infrastructure construction, and serious brain drain. Liu Jin et al. [11] proposed countermeasures to make up for the shortcomings of economic development in western China in response to the bottleneck problems of low investment efficiency, difficult industrial transformation, weak innovation ability, and low degree of openness in the development of western China. Han Bingxi et al. [12] conducted field research in Dachuan District, Sichuan Province, and took Dachuan as an example to explore and summarize the experience and enlightenment of promoting rural revitalization in western China to achieve high-quality development. In addition, some scholars have discussed the paths and strategies for the high-quality development of the rural economy in western China from the perspectives of policy support, industrial integration, and ecological protection. These studies provide an important reference for understanding the current situation and challenges of the high-quality development of the rural economy in western China, but there is relatively little research on the role and impact of digital countryside construction in it. Therefore, how to better promote digital countryside construction in western China and give full play to its empowering role in the high-quality development of the rural economy still requires further research and exploration.

2.4. Literature Review Summary

Overall, current research on the measurement of digital countryside construction level, its impact mechanism on the high-quality development of the rural economy, and the high-quality development of the rural economy in western China has made some progress, but there are still some shortcomings. First, the measurement methods of digital countryside construction level are not unified, and there are large differences in the indicator systems and measurement methods of different studies, leading to certain impacts on the comparability and consistency of the results. Second, the research on the impact mechanism of digital countryside construction on the high-quality development of the rural economy is not deep enough, especially the research on differences under different regional and industrial backgrounds. Finally, there are many studies on the high-quality development of the rural economy in western China, but relatively few studies on the role and impact of digital countryside construction in it. Therefore, future research needs to further deepen the discussion on the mechanism of digital countryside construction empowering the high-quality development of the rural economy, especially in the unification of measurement methods, the refinement of the action mechanism, and the research on regional differences, in order to provide a more scientific and comprehensive basis for related theoretical research and practical application.

3. Construction of the Indicator System for Measuring Digital Countryside Development Level

3.1. Construction of the Evaluation System

According to the requirements of the seven aspects of work tasks in the "Digital Countryside Development Strategy Outline" and the availability and representativeness of data, this indicator system sets four first-level indicators that can represent the level of digital countryside construction: digital infrastructure construction, economic digitization, rural governance digitization, and life digitization. A comprehensive indicator system is used to comprehensively evaluate the level of digital countryside development, and the entropy method is used for calculation.

Digital infrastructure construction is specifically represented by the rural internet penetration rate, agricultural meteorological observation stations, and the service scope of information technology application; the secondary indicators of rural economic digitization mainly include digital transaction level and financial digitization; the measurement indicators of rural governance digitization include capital supply and information service consumption level. The secondary indicator of life digitization is measured by information technology services. The specific explanatory variables of each secondary indicator are shown in Table 1.

Table 1. Indicator System for Digital Countryside Development Level in Western China

First-level Indicator	Second-level Indicator	Explanation Variable of Second-level Indicator
Digital Infrastructure Construction	Internet Penetration Rate	Number of rural broadband access households (units)
	Agricultural Meteorological Observation Station	Number of rural meteorological station detection services (units)
	Service Scope of Information Technology Application	Rural delivery routes (units)
Economic Digitization	Digital Transaction Level	E-commerce sales and purchase volume (billion yuan)
	Financial Digitization	Overall indicator of inclusive finance index
Governance Digitization	Capital Supply	Local government expenditure on urban and rural community affairs (billion yuan)
	Information Service Consumption Level	Per capita rural transportation and communication consumption expenditure (yuan)
Life Digitization	Information Technology Services	Total telecommunications business volume (billion yuan)

3.2. Data Collection and Processing

Data come from multiple sources, including the "China Statistical Yearbook", the National Bureau of Statistics website, the Peking University Digital Financial Inclusion Index, and the Taobao Village Research Report. For some missing data, the linear interpolation method is used for supplementation to ensure the completeness and continuity of the data.

This study selects balanced panel data from 11 provinces in western China from 2013 to 2022 as the research sample. There are missing data for some years in the data sample, which are supplemented based on the average growth rate of other years.

3.3. Measurement Method for Digital Countryside Development Level

Step 1: Indicator Standardization Processing

Due to the different dimensions and value ranges of different indicators, it is necessary to standardize the indicators to facilitate subsequent comprehensive evaluation. The standardization method is as follows:

For positive indicators (the larger the value, the better), use the following formula for standardization:

For negative indicators (the smaller the value, the better), use the following formula for standardization:

$$a_{ij} = \frac{\max(x_{ij}) - x_{ij}}{\max(x_{ij}) - \min(x_{ij})}$$

Step 2: Entropy Method for Weight Calculation The entropy method is an objective weighting method that determines the weight of each indicator by calculating its information entropy. The specific steps are as follows:Calculate the proportion of each indicator:

$$p_{ij} = \frac{a_{ij}}{\sum_{i=1}^{m} a_{ij}}$$

Then calculate the information entropy of each indicator:

$$e_i = -\frac{1}{\ln m} \sum_{j=1}^{m} p_{ij} \ln p_{ij}$$

Next, calculate the difference coefficient of each indicator:

$$d_i = 1 - e_i$$

Then calculate the weight of each indicator:

$$w_i = \frac{d_i}{\sum_{i=1}^{n} d_i}$$

Step 3: Comprehensive Score Calculation Based on the standardized values and weights of each indicator, calculate the comprehensive score of the digital countryside development level for each province:

$$S_j = \sum_{i=1}^{n} w_i \times a_{ij}$$

Through the above steps, the digital countryside development level scores of each province in different years can be obtained, providing basic data for subsequent empirical analysis.

4. Empirical Analysis

4.1. Sample Selection and Data Sources

This paper selects balanced panel data from 11 provinces in western China from 2013 to 2022 as the research object, with a total sample size of 310, to study the relationship between the digital countryside development level and the total output value of agriculture, forestry, animal husbandry, and fishery. Among them, data on the digital countryside development level come from the "China Statistical Yearbook", the National Bureau of Statistics website, the Peking University Digital Financial Inclusion Index, and the Taobao Village Research Report. Data on the total output value of agriculture, forestry, animal husbandry, and fishery come from the "China Rural Statistical Yearbook" over the years. Data on total import and export volume, fixed asset investment, and R&D expenditure come from the EPS database. Some missing values are supplemented by the linear interpolation method. To alleviate the impact of heteroscedasticity, variables other than the digital countryside development level are logarithmically processed.

4.2. Variable Definitions

(1) Explained Variable

Referring to the practices of Tan Yiming and Gao Xinyue, the total output value of agriculture, forestry, animal husbandry, and fishery is selected to measure the level of agricultural economic development. It is believed that the total output value of agriculture, forestry, animal husbandry, and fishery can reflect the total product of agriculture, forestry, animal husbandry, and fishery and the value of various supportive service activities for agricultural production

activities. It is an important indicator of the level of agricultural economic development, with comprehensiveness and monetary expression characteristics.

(2) Explanatory Variable

The explanatory variable of this paper is the digital countryside development level (X). At present, the academic community has not formed a unified standard for the measurement method of digital countryside construction level. The measurement methods are divided into single indicator measurement and comprehensive indicator measurement. The single indicator method generally uses the number of mobile phones owned by farmers at the end of the year to measure. Comprehensive indicators mainly measure the digital countryside construction level from four aspects: rural digital infrastructure, rural economic digitization, rural governance digitization, and rural life digitization. Based on the measurements of Lu Xinyuan et al. and Lei Zekui et al. on the digital countryside development level, this paper constructs a comprehensive indicator system containing digital infrastructure construction, economic digitization, governance digitization, and life digitization to comprehensively evaluate the digital countryside development level, and uses the entropy method for calculation. The specific indicator composition is as follows:

Table 2. Measurement System for Digital Countryside Development Level

First-level Indicator	Second-level Indicator	Measurement Method	Indicator Direction	Data Source
Digital Infrastructure Construction	Internet Penetration Rate	Number of rural broadband access households (units)	+	China Statistical Yearbook
	Agricultural Meteorological Observation Station	Number of rural meteorological station detection services (units)	+	China Statistical Yearbook
	Service Scope of Information Technology Application	Rural delivery routes (units)	+	China Statistical Yearbook
Economic Digitization	Digital Transaction Level	E-commerce sales and purchase volume (billion yuan)	+	China Statistical Yearbook
	Financial Digitization	Overall indicator of inclusive finance index	+	Peking University Digital Financial Inclusion Index
Governance Digitization	Capital Supply	Local government expenditure on urban and rural community affairs (billion yuan)	+	National Bureau of Statistics
	Information Service Consumption Level	Per capita rural transportation and communication consumption expenditure (yuan)	+	China Statistical Yearbook
Life Digitization	Information Technology Services	Total telecommunications business volume (billion yuan)	+	China Statistical Yearbook

(3) Control Variables

Total import and export volume (TFT), fixed asset investment (FAI), and R&D expenditure (RD) are selected as control variables. The specific meanings and explanations of related variables are shown in the table below.

Table 3. Variable Names and Definitions

Variable Name	Variable Definition	Explanation Method
Explained Variable	Total output value of agriculture, forestry, animal husbandry, and fishery Y	Total output value of agriculture, forestry, animal husbandry, and fishery
Explanatory Variable	Digital countryside development level X	Calculated by entropy method
Control Variables	Trade openness tft	Total import and export volume
	Fixed asset investment fai	Total fixed asset investment
	Research level RD	R&D expenditure of industrial enterprises above designated size

4.3. Model Construction

The model is constructed as follows:

$$Y_{i,t} = \alpha_0 + \alpha X_{i,t} + \alpha_2 tft_{i,t} + \alpha_3 fai_{i,t} + \alpha_4 rd_{i,t} + \varepsilon_{i,t}$$

Where, i represents the province, t represents the year, α1 to α4 represent the impact of digital countryside development level, total import and export volume, total fixed asset investment, and R&D expenditure of industrial enterprises above designated size on the total output value of agriculture, forestry, animal husbandry, and fishery Y, respectively, and ε_it is the random error term.

4.4. Descriptive Statistics

Descriptive statistics are performed on the collected data, calculating the sample size (N), mean, standard deviation (sd), minimum value (min), and maximum value (max) of each variable. By analyzing the statistical characteristics of variables such as the total output value of agriculture, forestry, animal husbandry, and fishery and the digital countryside development level, the data distribution is preliminarily understood, such as the differences in the development of agriculture, forestry, animal husbandry, and fishery in various provinces and the degree of difference and dispersion of digital countryside construction level in western provinces.

Table 4. Descriptive Statistics

VARIABLES	N	mean	sd	min	max
y	110	7.792	0.883	5.738	9.191
x	110	0.289	0.148	0.0405	0.789
tft	110	5.134	1.418	1.194	7.318
fai	110	9.381	0.753	7.767	10.69
rd	110	4.390	1.046	1.872	6.273

The descriptive statistics of the variables are as above. From the explained variable, the total output value of agriculture, forestry, animal husbandry, and fishery (Y), the maximum value is 9.191, but the minimum value is only

5.738, and there is a significant gap between the maximum and minimum values, which indicates that the development status of agriculture, forestry, animal husbandry, and fishery in western provinces of China shows great differences. The average value of the explanatory variable digital countryside development level is 0.289, the minimum value is 0.0405, and the maximum value is 0.789, indicating that there are large differences in the digital countryside development level of different provinces in western China. The standard deviation is only 0.148, indicating that the dispersion degree of digital countryside construction level in various provinces is low, and the digital countryside construction level of various provinces is close to the average value.

4.5. Fixed Effects Regression

The fixed effects model is used for regression to control the impact of individual differences (unobservable factors at the provincial level) on the results. The regression results are used to judge the impact direction and significance of variables such as digital countryside development level and R&D expenditure of industrial enterprises above designated size on the total output value of agriculture, forestry, animal husbandry, and fishery, and then draw conclusions on the relationship between digital countryside construction and the growth of the total output value of agriculture, forestry, animal husbandry, and fishery.

This paper chooses the fixed effects model for regression. The regression results are shown in the table below. It can be seen that the regression coefficients of digital countryside development level and R&D expenditure of industrial enterprises above designated size are both positive and have passed the significance test at the 1% level, indicating that the improvement of digital countryside development level and R&D expenditure of industrial enterprises above designated size can significantly promote the increase of the total output value of agriculture, forestry, animal husbandry, and fishery. That is, for every 1 percentage point increase in the digital countryside development level, the total output value of agriculture, forestry, animal husbandry, and fishery increases by 0.57 percentage points. This indicates that digital countryside construction is an important driving force for the increase of the total output value of agriculture, forestry, animal husbandry, and fishery. Digital countryside construction effectively improves the production efficiency and market competitiveness of agriculture, forestry, animal husbandry, and fishery by strengthening rural informatization infrastructure, promoting smart agricultural technology, and optimizing the industrial structure, thereby promoting the increase of the total output value of agriculture, forestry, animal husbandry, and fishery. For every 1 percentage point increase in R&D expenditure of industrial enterprises above designated size, the total output value of agriculture, forestry, animal husbandry, and fishery increases by 0.47 percentage points. The increase in R&D expenditure of industrial enterprises above designated size can promote technological innovation and industrial upgrading, drive the research and application of related technologies in agriculture, forestry, animal husbandry, and fishery, thereby improving production efficiency and output, and achieving the growth of the total output value of agriculture, forestry, animal husbandry, and fishery.

Table 5. Individual Fixed Effects Regression Results

	(1) y
X	0.5734*** (0.1566)
tft	-0.0592** (0.0285)
fai	0.0771 (0.0551)
rd	0.4655*** (0.0476)
_cons	5.1626*** (0.4700)
N	110
adj. R^2	0.848

Standard errors in parentheses * p<0.1, p<0.05, * p<0.01

4.6. Robustness Tests

To ensure the reliability of the basic regression results, this paper conducts robustness tests mainly by replacing the explanatory variable and changing the measurement method.

First, the explanatory variable is replaced: Gross Domestic Product (GDP) is selected as a proxy indicator for the total output value of agriculture, forestry, animal husbandry, and fishery, and is reintroduced into the model for regression analysis to observe the impact of the digital village development level on this new indicator. This verifies the robustness of the original regression results under different indicator settings. Furthermore, the measurement method is changed: the TOPSIS method is used to reassess the digital village development level, and the regression analysis is performed again. By comparing the regression coefficients and significance levels before and after the change, the conclusion that digital village construction promotes the total output value of agriculture, forestry, animal husbandry, and fishery is confirmed to be reliable.

4.6.1. Replacing the Explanatory Variable

Gross Domestic Product (GDP) is a core indicator measuring the economic development level of a region. Its influence is profound, affecting not only the macroeconomic level but also indirectly reflecting the prosperity of the rural economy in that region. Given this characteristic, we decided to use GDP as a proxy for the total output value of agriculture, forestry, animal husbandry, and fishery (Y) and reintroduce it into the model for regression analysis. The regression results are shown in column (1) of Table 6. At the 1% significance level, the improvement in the digital village development level significantly promotes GDP, indicating that the fixed-effects regression results are robust.

4.6.2. Changing the Measurement Method

The core explanatory variable in this paper, the digital village development level, was originally calculated using the entropy method. To verify the robustness of the results, we adopted another measurement method—the TOPSIS method—to reassess the digital village development level. The regression results are shown in column (2) of Table 6. The regression coefficient and significance level of digital village construction on the total output value of agriculture, forestry, animal husbandry, and fishery did not change substantially. This indicates that the promoting effect of digital village construction on the total output value of agriculture, forestry, animal husbandry, and fishery is robust.

Table 6. Robustness Test Results

	(1) gdp	(2) y
x	0.6186***	
	(0.1181)	
tft	0.0025	-0.0476*
	(0.0215)	(0.0282)
fai	0.1352***	0.0811
	(0.0415)	(0.0549)
rd	0.4286***	0.4479***
	(0.0359)	(0.0511)
c	0.6980***	5.0918***
	(0.1926)	(0.4612)
_cons	-3.1015***	
	(0.3544)	
N	110	110
adj. R2	0.915	0.848
Standard errors in parentheses	* p < 0.1, p < 0.05, * p < 0.01	

5. Conclusions and Recommendations

5.1. Conclusions

Based on the measurement of the digital village development level in western China and the empirical analysis of its impact on the total output value of agriculture, forestry, animal husbandry, and fishery, this paper draws the following conclusions: First, the digital village development level has a significant positive promoting effect on the total output value of agriculture, forestry, animal husbandry, and fishery, indicating that digital village construction can effectively enhance the development level of the rural economy. Second, there are significant differences in the digital village development level among different provinces, which may be closely related to factors such as the economic development level, infrastructure construction, and policy support intensity in each region. Finally, the robustness test results further verify the reliability of the research conclusions, demonstrating that the promoting effect of digital village construction on high-quality development of the rural economy is relatively stable.

5.2. Recommendations

5.2.1. Strengthen Digital Infrastructure Construction

Digital infrastructure is the foundation of digital village construction, and its degree of completeness directly affects the application effectiveness of digital technology in rural areas. It is recommended to increase investment in network infrastructure in rural areas, improve network coverage and quality, and ensure that rural residents can conveniently access and use digital resources. Simultaneously, strengthen the construction of logistics and distribution systems in rural areas, improve supporting facilities for agricultural product e-commerce, and provide strong support for the online sales of agricultural products. Furthermore, attention should be paid to the construction of digital public service facilities in rural areas, such as digital cultural centers and digital healthcare stations, to meet the growing demands of rural residents for digital life and lay a solid foundation for digital village construction.

5.2.2. Enhance Farmers' Digital Literacy

Farmers are the main actors in digital village construction, and their digital literacy directly influences the penetration and application effectiveness of digital technology in rural areas. It is recommended to strengthen digital skills training for farmers, integrate digital technology applications into the rural vocational education and adult education systems, and carry out diverse forms of digital skills training courses to improve farmers' awareness and application capabilities of digital technology. Meanwhile, encourage farmers to actively participate in activities related to digital village construction, such as agricultural product e-commerce sales and smart agriculture applications, to enhance their digital literacy through practice. Additionally, attention should be paid to cultivating farmers' digital security awareness, educating them on the correct use of digital technology, preventing risks such as online fraud, and protecting their legitimate rights and interests in digital village construction.

5.2.3. Promote Deep Integration of Digital Technology and Rural Industries

The deep integration of digital technology and rural industries is key to achieving high-quality development of the rural economy. It is recommended to encourage and support entities such as agricultural enterprises and research institutions in strengthening the research, development, and application of digital technology, and promote the widespread application of digital technology in various stages of agricultural production, processing, and sales. For example, in the agricultural production stage, utilize technologies like the Internet of Things and big data to achieve precise agricultural management and improve agricultural production efficiency and product quality; in the agricultural product processing stage, optimize processing techniques through digital means to increase product added value; in the agricultural product sales stage, expand sales channels with the help of e-commerce platforms to achieve online sales and brand development of agricultural products. Simultaneously, attention should be paid to developing new forms of the rural digital economy, such as rural e-commerce, smart agriculture, and digital rural tourism, to promote the integrated development of primary, secondary, and tertiary industries in rural areas and inject new vitality into the high-quality development of the rural economy.

5.2.4. Improve the Policy Support System

Policy support is an important guarantee for promoting digital village construction. It is recommended that the government further improve the policy support system for digital village construction, increase financial investment, and establish special funds to support the construction of rural digital infrastructure, the promotion of digital technology applications, and the enhancement of farmers' digital literacy. Meanwhile, formulate corresponding tax incentive policies to encourage enterprises and social capital to participate in digital village construction. Furthermore, policy coordination and overall planning should be strengthened to form a multi-departmental collaborative mechanism for advancing digital village construction, ensuring the effective implementation of various policy measures, and creating a favorable policy environment for digital village construction.

5.2.5. Strengthen Regional Collaborative Development

Regional collaborative development is an important way to achieve high-quality development of the rural economy in western China. It is recommended to enhance communication and cooperation among provinces in western China, establish a regional collaborative development mechanism for digital village construction, and promote resource sharing and

complementary advantages within the region. For example, provinces with a stronger economic base can provide technical support and experience sharing to other provinces to help accelerate their digital village construction; provinces with abundant resources can cooperate with provinces with a stronger economic base to jointly develop industrial projects related to digital village construction. Simultaneously, attention should be paid to strengthening cooperation with eastern regions, learning from their advanced experiences and successful models in digital village construction, promoting collaborative development in the field of digital village construction between eastern and western regions, and achieving coordinated development and common prosperity among regions.

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