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Analysis of the synergistic development of rural digital economy and rural revitalization in Hunan, China

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Abstract:*In order to explore the development status of rural digital economy and rural revitalization in Hunan, China and to promote deeper synergistic development of the two, an evaluation index system for rural digital economy is constructed from three sub-systems, namely rural digital infrastructure construction, rural digital industrialization and rural industry digitization, and an evaluation index system for rural revitalization is constructed from five dimensions, namely, industrial prosperity, ecological livability, civilized rural culture, effective governance and affluent life. Quantitative analysis of the coordinated development and interactive correlation between the rural digital economy and rural revitalization in Hunan from 2015 to 2021. The study finds that: the development of the rural digital economy subsystem in Hunan, China is relatively uneven, rural digital economy and rural revitalization have shifted from primary dissonance to a high-quality coordination stage, the synergistic development trend is obvious, and the whole is on a rapid upward trend; there are obvious differences in the correlation levels of the factors of rural digital economy and the five dimensions of rural revitalization subordinate to the rural digital economy, and internal synergistic development is not balanced. It is recommended to improve the digital infrastructure investment, digital talent cultivation and digital economy system in three aspects, to provide necessary support and institutional guarantee for the development of rural digital economy by upgrading the level of digital infrastructure in rural areas, introducing relevant supportive policies to cultivate digital talents, optimizing the tax system and adopting incentives, etc., to promote synergistic development of rural digital economy and rural revitalization.*

Keywords:*Ruraldigital economy, Rural revitalization, Grey Relational, Coupling coordination degree, Synergistic development*

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I. Background of the study

In recent years, the rural digital economy has gradually developed into a new engine for high-quality rural development. As the earliest pioneer province in the development of the digital economy[1], Hunan has become an important issue on how to hold on to the ticket of the era of digital economic development and use the dividends of digital economic development to promote rural revitalization. This paper explores and analyzes the coordinated development and associated interaction status of rural digital on rural revitalization in Hunan from 2015 to 2021 based on constructing a basic evaluation index system of rural digital economy and rural revitalization in Hunan. Thus, it objectively understands the development law of the two and puts forward policy suggestions to promote the synergistic development of the rural digital economy and rural revitalization in Hunan.

Although studies have explored the impact of the digital economy on rural revitalization from various perspectives, such as the path of empowerment, internal mechanisms and theoretical mechanisms, they have generally explored the interaction mechanism between the two at a qualitative level and lacked quantitative research. At the same time, there is no empirical research exploring the coordinated development of rural digital

economy and rural revitalization, and there is a lack of econometric methods to analyze the impact and interaction between rural digital economy and rural revitalization at both the overall and local levels. This paper combines the latest statistical data of Hunan and constructs an evaluation index system of the rural digital economy and rural revitalization in Hunan based on combining the existing research results. The coupling coordination degree model is used to study the coupling and coordination process of rural digital economy and rural revitalization and explore its coordinated development path. Using the grey correlation analysis model, explore and analyze the correlation and interaction of the factors of the rural digital economy on the various dimensions of rural revitalization, analyze the influence and interaction degree of the rural digital economy and its subsystems on the development level of rural revitalization from the whole, and analyze the correlation and interaction degree of the constituent elements of rural digital economy on the development of rural revitalization in the development of industrial prosperity, ecological livability, civilized township style, effective governance, and effective governance from a local perspective, The degree of correlation and interaction of rich life. In this way, we can accurately grasp and analyze the practical paths of developing a rural digital economy for rural revitalization in different periods, and at the same time provide theoretical guidance for the development of a rural digital economy in Hunan.

II. Research design on synergistic development of digital economy and rural revitalization in agriculture and rural areas

2.1 Indicator selection

Regarding the definition of agricultural and rural digital economy, this paper refers to the definition of Mu (2021), that is: agricultural and rural digital economy is an economic activity that develops digital infrastructure in rural areas and utilizes digital technology and information technology to promote agricultural and rural development[2]. Combined with the Hunan Provincial Digital Economy Development Plan (2020-2025) to construct a rural digital economy evaluation index system containing rural digital infrastructure, rural digital industrialization, and rural industry digitization[3]. Rural revitalization strategy is the programmatic plan of the Party Central Committee for the development of rural areas, which plays a leading and promoting role in guiding the development of rural revitalization in various regions and sectors. This paper constructs evaluation indexes under the requirements of the five-in-one "twenty-word" guideline for rural revitalization[4]. The evaluation index system of the rural digital economy and rural revitalization in Hunan is shown in Table 1.

Table 1 Evaluation index system of rural digital economy and rural revitalization in Hunan

	Level 1 indicators	Secondary indicators	Indicator interpretation (variable name)	causality	weights
Rural digital economy	Rural digital infrastructure	Rural smartphone penetration	Average annual ownership of cellular phones by rural residents in 100 households (units/100 persons)	forward	0.1439
		Number of rural broadband access subscribers	Number of rural broadband subscribers (million)	forward	0.1488
	Rural digital industrialization	Rural logistics construction	Rural postal delivery routes (kilometers)	forward	0.1323
		Level of Rural Financial Inclusion	Rural Digital Financial Inclusion Index[5] (-)	forward	0.1583
	Digitalization of rural industries	Digital Agricultural Base	Number of Taobao villages (number)	forward	0.2232
		Level of e-commerce in agricultural products	Retail sales of agricultural e-commerce (billions of dollars)	forward	0.1934
Rural revitalization	thriving industry	labor productivity	Value added of primary industry/number of employees in primary industry	forward	0.2633
	ecologically livable	Pesticide application intensity	Pesticide application (kg)/cultivated land area (ha)	negative direction	0.1176
	civilized rural customs (PRC official moral code)	Level of compulsory education in rural areas	The proportionof full-time teachers in compulsory education with a bachelor's degree or higher (%)	forward	0.1269
	Effective Governance	Urban-rural income gap	Ratio of income of urban and rural residents	negative direction	0.1548
	prosperous	Income of rural inhabitants	Per capita disposable income of rural residents (ten thousand yuan)	forward	0.3374

2.2 Research methodology

2.2.1Couplingcoordination degree model

The coupled coordination degree model is used to analyze the coordinated development level of things [6]. As the development level of the rural digital economy and rural revitalization are two sides of the modernization development of Hunan, it is difficult to objectively reflect the degree of coordination in the interaction process of the two systems through qualitative analysis, and the degree of coordinated development of rural digital

economy and rural revitalization ofHunan can be analyzed using the coupled coordination degree model.

In the first step, to objectively assign weights to the evaluation indicators, this paper applies the entropy value method to measure the comprehensive evaluation value of the development level of the rural digital economy and rural revitalization in Hunan from 2015 to 2021. Set evaluation indicators, and x_{ij} denotes the j th statistical data value of the i th year.

(1) Standardized data processing, due to the different scale of the original observation data, it is necessary to carry out standardized processing, at the same time, in order to comply with the formula operation requirements, and non-negative translation. Due to the different meanings of the attributes of the data, the larger the value of the positive indicator is, the better the development, and the negative indicator makes the smaller the value is, the better the development, using different standardization formulas.

Positive indicators are:

$$X_{ij} = \frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})} + 0.00001 (i = 1, 2, ..., n; j = 1, 2, ..., m) \tag{1}$$

Negative indicators are:

$$X_{ij} = \frac{\max(x_{ij}) - x_{ij}}{\max(x_{ij}) - \min(x_{ij})} + 0.00001 (i = 1, 2, ..., n; j = 1, 2, ..., m) \tag{2}$$

(2) Characteristic weight P_{ij} refers to the weight of the j indicator in the year i to the total indicator with the following formula:

$$P_{ij} = \frac{X_{ij}}{\sum_{i=1}^{n} X_{ij}} \tag{3}$$

(3) Calculate the entropy value of the indicator j e_j with the following formula:

$$e_j = -k \sum_{i=1}^{m} p_{ij} \ln(P_{ij}) \tag{4}$$

where $k = 1/\ln(m) > 0$, satisfies $e_j \geq 0$.

(4) Calculate the entropy redundancy of the indicator's j th item T_j with the following formula:

$$T_j = 1 - e_j \tag{5}$$

(5) Calculate the weight of each indicator W_j with the following formula:

$$W_j = \frac{T_j}{\sum_{i=1}^{n} T_j} \tag{6}$$

(6) Calculate the level of rural digital economy development in the year i with the following formula:

$$U_1 = \sum_{j=1}^{m} W_J * X_{ij} \tag{7}$$

(7) Calculate the level of rural revitalization development in the year i with the following formula:

$$U_2 = \sum_{j=1}^{m} W_J * X_{ij} \tag{8}$$

In the second step, the coupling degree between rural digital economy and rural revitalization is calculated with the following formula:

$$C=2*\left\{U_1*U_2/[U_1+U_2)]^2\right\}^{\frac{1}{2}},0\le U_1\le 1,0\le U_2\le 1,C\in[0,1] \tag{9}$$

In the third step, the coupling coordination degree of rural digital economy and rural revitalization is calculated with the following formula:

Harmonized value T :

$$T=\alpha U_1+\beta U_2(\alpha+\beta=1) \tag{10}$$

Coupling harmonization D :

$$D=\sqrt{C*T}(D\in[0,1]) \tag{11}$$

Among them, α and β are the pending coefficients, representing the development level of rural digital economy and rural revitalization to help the local development, in order to be more scientific and objective to the pending coefficients to take the value of the sensitivity analysis of the degree of coordination of the coupling, the pending coefficients of α and β will be substituted into the sensitivity analysis of the degree of coordination of the coupling of 0.9:0.1, 0.7:0.3, 0.5:0.5, 0.3:0.7, 0.1:0.9, respectively.

Next, the coupling coordination degree results are grouped and rated, and the division criteria refer to Table 2.

Table 2 Rural digital economy and rural revitalization coupling and coordination degree classification criteria

Interval of coupling coordination degree	[0,0.4)	[0.4,0.5)	[0.5,0.6)	[0.6,0.8)	[0.8,1]
Type of coordination	severe disorder	elementary disorder	Primary coordination	good coordination	Quality coordination

According to the common coupling coordination degree interval, we can classify the coordination degree of rural digital economy and rural revitalization into 5 levels.

Severe dissonance: coupling less than 0.4. this implies less interaction between the rural digital economy and rural revitalization, which may lead to lagging and unbalanced synergistic development.

Primary dissonance: coupling between 0.4 and 0.5. This means that there is some interaction, but there is a lack of coordination, which manifests itself in problems such as poor information flow between the parties and irrational allocation of resources.

Primary coordination: the coupling level is between 0.5 and 0.6. This means that the interaction between the parties has improved, but there are still some coordination problems, such as mismatches between demand and supply.

Good coordination: the coupling degree is between 0.6 and 0.8. This means that the interaction between the rural digital economy and rural revitalization is more adequate and better coordinated, for example, in terms of policy support and resource allocation.

High-quality coordination: the coupling degree is greater than 0.8. this means that the interactions between the rural digital economy and rural revitalization are very close and well coordinated, and can promote the sustained and stable development of both sides, as well as the synergistic development of rural modernization.

2.2.2 Grey relational analysis

Grey correlation analysis is to determine the geometric similarity between the characteristic sequence (parent sequence) and several comparison sequences (sub-sequences) to determine whether they are closely related to each other, which reflects the degree of correlation between the sequence curves. Moreover, grey correlation analysis can better overcome the defects brought by small samples in regression analysis, and can accurately find out the valuable correlations in the "poor information" of small sample size[7] . Therefore, this paper applies grey Relational analysis to study the correlation and interaction process between factors of the rural digital economy and dimensions of rural revitalization in Hunan.

Step 1. set the factors of the rural digital economy as the sub-sequence, i.e. the data series composed of the factors. Set rural revitalization as the mother series, i.e., the data series reflecting the characteristics of the system.

Step 2. the dimensionless processing of the data, using the normalized values from the previous entropy weighting measure.

Step 3. set the i th indicator of the sub-series in the year t as $x_i(t)$, set the standardized value of the j

th indicator of the parent series in the year t as $y_j(t)$, and then calculate the difference between the sub-series and the parent series and the correlation coefficient, with the following formulas:

$$\zeta_{\ddot{j}}(t)=\frac{\Delta(\min)+\rho_{\Delta}(\max)}{\Delta_{ij}(t)+\rho_{\Delta}(\max)} \tag{12}$$

$$\Delta(\min)=\min_i \min_j \left|x_i(t)-y_j(t)\right|$$

$$\Delta(\max)=\max_i \max_j \left|x_i(t)-y_j(t)\right|$$

$$\Delta_{ij}(t)=\left|y_j(t)-x_i(t)\right|$$

Where the absolute difference is $\Delta_{ij}(t)$; the minimum difference between two levels is $\Delta(\min)$; the maximum difference of two levels is $\Delta(\max)$; ρ is the discrimination coefficient, and the correlation coefficient of the subsequence of two sequences in different years with the parent sequence can be obtained by the above formula.

Step 4, the degree of association between the subsequence and the parent sequence is calculated by the following formula R_{ij} , with a value ranging from 0 to 1, and the larger the value of R_{ij} the closer it is to 1, indicating that the correlation is greater, and ranking.

$$R_{ij}=\frac{1}{n}\sum_{t=1}^{n}\zeta_{ij}(t) \tag{13}$$

2.3 Analysis of the results of the coupling coordination degree and correlation degree between rural digital economy and rural revitalization in Hunan

2.3.1 Analysis of coupling harmonization results

By substituting the data of rural digital economy and rural revitalization in Hunan in 2015-2021 into the formula for calculating the degree of coupling and coordination, the comprehensive evaluation value of the development level of rural digital economy and rural revitalization in Hunan in 2015-2021 can be obtained, as well as the degree of coupling and coordination of the two. Table 3 shows the sensitivity analysis results when the pending coefficients α and β are substituted into 0.9:0.1, 0.7:0.3, 0.5:0.5, 0.3:0.7, 0.1:0.9, respectively, and there is a certain impact on the coupling coordination degree and coordination type of rural digital economy and rural revitalization in the extreme cases of 0.9:0.1 and 0.1:0.9 coefficients, but it does not correspond to the actual situation, and at the same time the degree of coordination The overall trend of change is not large, so the pending coefficients in the following analysis are all taken as 0.5.

Table 3Coupling coordination degree and sensitivity analysis of rural digital economy and rural revitalization in Hunan, 2015-2021

α Contribution factor	β Contribution factor	vintages	Rural digital economy level of development	Rural revitalization level of development	coupling (physics)	degree of coupling coordination	Sensitivity factor for coupling harmonization (%)
0.9	0.1	2015	0.160	0.000	0.079	0.107	33.75
		2016	0.169	0.073	0.919	0.383	14.67
		2017	0.354	0.146	0.909	0.550	15.55
		2018	0.435	0.246	0.961	0.632	10.49
		2019	0.522	0.287	0.957	0.691	11.09
		2020	0.687	0.690	1.000	0.829	-0.12
		2021	0.962	1.000	1.000	0.982	-0.81
0.7	0.3	2015	0.160	0.000	0.079	0.094	17.50
		2016	0.169	0.073	0.919	0.359	7.49
		2017	0.354	0.146	0.909	0.515	8.19
		2018	0.435	0.246	0.961	0.603	5.42

α Contribution factor	β Contribution factor	vintages	Rural digital economy level of development	Rural revitalization level of development	coupling (physics)	degree of coupling coordination	Sensitivity factor for coupling harmonization (%)
		2019	0.522	0.287	0.957	0.657	5.63
		2020	0.687	0.690	1.000	0.830	0.00
		2021	0.962	1.000	1.000	0.986	-0.40
		2015	0.160	0.000	0.079	0.080	
		2016	0.169	0.073	0.919	0.334	
		2017	0.354	0.146	0.909	0.476	
0.5	0.5	2018	0.435	0.246	0.961	0.572	
		2019	0.522	0.287	0.957	0.622	
		2020	0.687	0.690	1.000	0.830	
		2021	0.962	1.000	1.000	0.990	
		2015	0.160	0.000	0.079	0.062	-22.50
		2016	0.169	0.073	0.919	0.306	-8.38
		2017	0.354	0.146	0.909	0.435	-8.61
0.3	0.7	2018	0.435	0.246	0.961	0.539	-5.77
		2019	0.522	0.287	0.957	0.585	-5.95
		2020	0.687	0.690	1.000	0.830	0.00
		2021	0.962	1.000	1.000	0.994	0.40
		2015	0.160	0.000	0.079	0.036	-55.00
		2016	0.169	0.073	0.919	0.276	-17.37
		2017	0.354	0.146	0.909	0.389	-18.28
0.1	0.9	2018	0.435	0.246	0.961	0.504	-11.89
		2019	0.522	0.287	0.957	0.545	-12.38
		2020	0.687	0.690	1.000	0.830	0.00
		2021	0.962	1.000	1.000	0.998	0.81

(1) From the viewpoint of the development level of rural digital economy and rural revitalization in Hunan (see Table 7), the development level of rural digital economy and the development level of rural revitalization in Hunan have both seen a more obvious increase in the past few years. From the data on the development level of the rural digital economy, between 2015 and 2019, the composite index shows a trend of yearly growth, while in 2020 and 2021, it is rapidly increasing. In contrast, the composite index of the development level of rural revitalization began to increase year by year after 2016 and reached a high level in 2021. It shows that Hunan has taken a series of active policy measures in the rural digital economy and rural revitalization and achieved remarkable results. It is also an important reflection of Hunan's continuous promotion of the rural modernization process.

(2) In terms of the degree of coupled coordination between the rural digital economy and rural revitalization in Hunan (see Table 7), Hunan had a low degree of coordination between the rural digital economy and rural revitalization in 2015 and 2016, which was at the stage of primary dissonance and primary coordination. With time, the degree of coordination gradually improved, and by 2020 and 2021, it had reached the level of good coordination and quality coordination, especially in 2021, the degree of coupled coordination between the two was close to 1, indicating that the development of rural digital economy and rural revitalization had reached a better state of coordination, with a sustainable, stable, and healthy development prospect. However, the growth rate of the rural digital economy development level and rural revitalization development level is not smooth enough, and there is volatility in the middle of the process of coupling and coordination between the two, which needs to be further analyzed by using grey Relational analysis to find out the root cause of the volatility, and further optimize the development strategy, to ensure the continuity and sustainability of the development.

2.3.2 Grey correlation result analysis

By applying grey correlation analysis, the grey correlation coefficients of each factor of the rural digital economy and the five major categories under rural revitalization in Hunan from 2015 to 2021 are calculated respectively, and the grey correlation degree is calculated and ranked (see Table 4). Thus, we analyze the degree

of influence of each factor of the rural digital economy on the five dimensions of rural revitalization and identify the key factors for the synergistic development of the rural digital economy and rural revitalization.

(1) In terms of industrial prosperity, the digital agricultural base has the highest correlation, reaching 0.837, ranking first; followed by the level of e-commerce of agricultural products, with a correlation of 0.795, ranking second. This indicates that digital agriculture and e-commerce agriculture, led by digital agricultural base, is an important pillar industry for the development of rural digital economy in Hunan, and the development of digital agricultural base and rural e-commerce in agriculture and rural areas can promote the transformation and upgrading of the agricultural industry as well as the increase of farmers' income in Hunan.

(2) In terms of ecological livability, rural financial inclusion has the highest degree of association, at 0.776. This is followed by the number of rural broadband access subscribers, which has the second highest degree of association, at 0.764, and the third-highest rural smartphone penetration rate. Rural digital inclusive financial services are one of the important foundations to support rural revitalization, which can increase the government's investment in public environmental governance. At the same time, the level of digitalization and informatization can also lead to the development of publicity work and villagers' environmental awareness in the field of rural ecological and environmental protection.

(3) In terms of rural civilization, the level of e-commerce of rural goods and the penetration rate of rural smart phones are the highest, ranking first and second at 0.768 and 0.761, respectively. The popularization of smart phones in rural areas can make it easier for farmers to receive information and participate in rural e-commerce, help farmers make better use of information technology to conduct online transactions, and improve their ability to receive information and knowledge.

(4) In terms of effective governance, the digital agricultural base has the highest correlation, 0.814, ranking first; followed by the level of e-commerce of agricultural products, with a correlation of 0.76, ranking second. The establishment of rural digital bases has led to the popularization of digital technology, helping managers to better grasp information on agricultural production, rural social conditions, demographics, etc., to understand the rural social conditions and farmers' needs, and to make more scientific and reasonable decisions. The e-commerce platform can also provide the government with the ability to achieve traceability, control and monitoring of the production, circulation and sale of agricultural products, and to realize the refinement and scientificization of rural governance.

(5) In terms of living affluence, the level of e-commerce in agricultural products and the popularization rate of rural smart phones have the highest correlation, 0.809 and 0.803 respectively, ranking first and second. This also confirms that the development of agricultural products e-commerce and the popularization of rural smart phones can drive rural economic development, improve the quality of human life in rural areas, and at the same time, it is also one of the effective ways to increase the income of farmers. Agricultural products e-commerce can break the traditional sales channels of agricultural products and expand customer sources while reducing the cost of intermediate links, thereby increasing the income of producers. Let farmers have more convenient access to information, understand the market situation, policy information, etc., to better formulate production and sales strategies, to improve the economic efficiency of agriculture.

Table 4Grey Relational of five dimensions of the rural digital economy and rural revitalization subordinates in Hunan, 2015-2021

Indicator name	Rural smartphone penetration	Number of rural broadband access subscribers	Rural logistics construction	Level of digital financial inclusion	Digital Agricultural Base	Level of e-commerce in agricultural products
thriving industry	0.734	0.737	0.536	0.749	0.837	0.795
arrange in order	5	4	6	3	1	2
ecologically livable	0.758	0.764	0.605	0.776	0.606	0.711
arrange in order	3	2	6	1	5	4
civilized rural customs (PRC official moral code)	0.761	0.76	0.53	0.748	0.718	0.768
arrange in order	2	3	6	4	5	1
Effective Governance	0.708	0.71	0.53	0.721	0.814	0.76
arrange in order	5	4	6	3	1	2
prosperous	0.803	0.797	0.5	0.788	0.717	0.809
arrange in order	2	3	6	4	5	1

III. Conclusions and Recommendations

3.1 Conclusion

This paper uses the entropy value method and the coupled coordination degree model to measure the development level and coordination degree of the rural digital economy and rural revitalization in Hunan from 2015 to 2021 and uses the grey correlation degree model to empirically analyze the correlation degree of each factor of the rural digital economy and the five dimensions of rural revitalization, and the results show that: there is obvious coordinated development of rural digital economy and rural revitalization, and the overall synergistic trend is rising The results show that the coordinated development of rural digital economy and rural revitalization is obvious, with an overall synergistic upward trend; however, there is a large gap between the correlation levels of the various components of the rural digital economy and the different dimensions of rural revitalization, and the internal development is not balanced, so there is a certain amount of optimization space.

3.1.1 The overall level of development of the rural digital economy and rural revitalization is on an upward trend, with good synergistic development.

From the perspective of development trend, the comprehensive index of rural digital economy and rural revitalization development in Hunan has shown a year-on-year growth trend, and the overall development trend is strong. At the same time, the coupling and coordination degree of the rural digital economy and rural revitalization in Hunan is also increasing year by year, from primary coordination in 2015 to high-quality coordination in 2021, indicating that the development of rural digital economy and rural revitalization promote each other and drive each other. However, the growth rate of rural digital economy development and rural revitalization development is not stable enough, and there are irregular fluctuations in the process of coupling and coordination between the two, which has a certain impact on the sustainable and stable development of rural digital economy and rural revitalization.

3.1.2 There is a large gap in the level of association between the rural digital economy and different dimensions of rural revitalization, with uneven internal development.

There is a large gap in the level of industrial association between the rural digital economy and the five categories under rural revitalization, with different key influencing factors in different dimensions of synergistic development. Specifically, the three categories of digital agricultural base and industrial prosperity and effective governance, rural e-commerce development and rural civilization and affluent life, and rural digital financial inclusion development and ecological livability have a high level of association, showing a high degree of interactive association. The correlation between a rural digital base and ecological livability and rural civilization shows medium synergy. However, the correlation between rural logistics construction and industrial prosperity, ecological livability, rural civilization, effective governance and affluent life is consistently lower than the average level, which also reflects that the internal synergistic development of the factors of the rural digital economy and the dimensions of rural revitalization is still uneven.

3.2Recommendations

At present, China is in the digital economy and rural revitalization of comprehensive and coordinated development, to achieve the goal of network power and agricultural power of the strategic opportunity, rural digital economy and rural revitalization of synergistic development in the rapid promotion of modernization of agriculture and rural areas to develop a unique role in the construction. However, some weak links and outstanding problems that have long constrained the development of the rural digital economy still exist, which need to be adjusted, optimized and upgraded in the construction of rural digital infrastructure, digital industrialization, and industrial digitization, to strengthen the highly synergistic development of rural digital economy and rural revitalization in Hunan.

3.2.1 The Government should introduce relevant policies to promote the coordinated development of the digital economy and rural revitalization

First, the government should further strengthen the cultivation and introduction of talent in the field of digital technology, break the talent bottleneck in the development of the rural digital economy and rural revitalization, and promote the interconnection of talents in the rural digital economy and rural revitalization in order to promote the synergistic development between the two. Secondly, the government needs to establish appropriate policies and regulations, optimize the tax system, lower the development threshold, formulate regulatory and coordination mechanisms to provide institutional support for the development of the digital economy and enhance the degree of coordination between the digital economy and rural revitalization, so as to ensure the smooth development of the rural digital economy and rural revitalization. In addition, the government should also strengthen the publicity and promotion of public awareness of the digital economy and rural revitalization, encourage farmers to participate in activities related to the development of the digital economy

and rural revitalization, increase public awareness of the rural digital economy and rural revitalization, actively promote digital technology and related new business forms, encourage farmers to participate in the entrepreneurship and development of the digital economy and stimulate the vitality of the development of the digital economy in rural areas. In short, the government should effectively enhance the degree of coordinated development of the rural digital economy and rural revitalization through policy guidance and farmers' participation, so as to promote the comprehensive revitalization of the countryside.

3.2.2 Further promoting the development of the rural digital economy and contributing to the overall revitalization of the countryside

Hunan should continue to accelerate the development of rural digital industrialization and industrial digitization, and further strengthen the links and coordination between the digital economy and rural revitalization. First, digital agricultural bases, e-commerce platforms and digital agricultural technology applications are important directions for promoting the development of a rural digital economy, and localities should attach great importance to the construction of digital agricultural bases, e-commerce platforms and digital agricultural technology applications. For example, the construction of rural logistics platforms should be strengthened to promote the development of rural e-commerce. At the same time, it should also increase investment in digital environmental protection, promote environmental protection APPs, and strengthen technical research on rural sewage treatment and garbage classification. The further use of digital technology makes it easier for villagers to participate in rural governance and makes the governance process more transparent, fair and democratic. In addition, local governments should increase investment in rural digital infrastructure construction, improve network coverage and bandwidth coverage, and provide basic guarantees for the development of the digital economy, to solve the problem of uneven development of the rural digital economy and rural revitalization. Using the rural digital economy to continue to promote the comprehensive revitalization of the countryside in all its five aspects, we can truly realize a beautiful countryside with digitized rural industries, ecological excellence, cultural modernization, effective governance and an affluent life.

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