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Optimization research on the integration development path of agricultural, cultural and tourism industries in Yijun County based on data analysis

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ABSTRACT

This paper firstly constructs a coupled evaluation index system based on three primary indicators, seven secondary indicators and 29 tertiary indicators for agriculture, culture and tourism. Then the entropy weight-TOPSIS method and the coupling coordination degree model are selected to measure the development of agriculture, culture and tourism industry and the coupling level in Yijun County respectively. Finally, 23 spatially related villages in Yijun county area are selected to reveal the reasons for their spatial differences with spatial measurement model, and analyze the factors affecting the coupled and coordinated development of agricultural, cultural and tourism industries in Yijun county area. From the comprehensive evaluation results, the trend of the development level of agriculture, culture and tourism in 2017-2023 was generally upward, in which the agriculture industry had the highest growth between 2022 and 2023, with an increase of 0.0445. After analyzing the factors influencing the development of the coupled agriculture, culture and tourism industries in the Yijun county region by applying the spatial Durbin model, it was found that the general budget expenditures, human capital, infrastructure construction, fixed asset investment and education investment in the region at a significant level of 0.01 correlation of 0.211, 0.03, 0.082 and 0.085, and education investment in the region at a significant level of 0.1 correlation of 0.211. These five factors significantly affect the Yijun County region agriculture, culture and tourism industry, and deepen the development of integration of tourism industry.

Keywords: entropy weight-TOPSIS method; coupled coordination degree model; spatial measurement model; agriculture, culture and tourism industry; Yijun County region

1. Introduction

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Located in the northeast of Baoji City, Shaanxi Province, Yijun County is a place with a long history and deep cultural heritage, as well as a scenic tourist destination, so Yijun County has a great potential for integrating the integration of agriculture, culture and tourism industries [1-3]. In recent years, with the growing demand for agriculture, culture and tourism, the integration of agriculture, culture and tourism has gradually become a new development mode [4-5]. The integrated development of agriculture, culture and tourism integrates agriculture, culture and tourism with each other, and forms the industrial chain and promotes the development of agricultural industry by carrying out agricultural cultural activities, agricultural tourism and brand promotion [6-8].

The integrated development of agriculture, culture and tourism is the new trend of current economic and social development. On the one hand, people have a higher pursuit of the quality and health of agricultural products, and the demand for agriculture is no longer limited to the supply of food [9-10]. On the other hand, people's demand for culture and tourism is also increasing, and the demand for displaying regional characteristics and experiencing new things is more urgent [11]. Therefore, the integrated development of agriculture, culture and tourism has become a model to meet people's needs. Realizing the integrated development of agriculture, culture and tourism has many advantages for Yijun County, such as increasing the added value of agricultural products, promoting the sharing of resources, and driving the development of local economy [12-15]. However, it is necessary to pay attention to the potential challenges and risks in the development process, and conduct comprehensive assessment and planning. Only through scientific development and full use of resources can the feasibility of integrated development of agriculture, culture and tourism be realized [16-18].

Literature [19] constructed a coupled coordination model based on the corresponding index system to examine the coupled and coordinated development of agriculture and tourism in Henan Province. The results emphasized that the comprehensive development level and coordination degree of agriculture and tourism in Henan Province continued to improve, and put forward suggestions for a sustainable development model. Literature [20] discusses the level of sustainable development of China's tourism industry based on the Global Sustainable Tourism Criteria (GSTC) and analyzes the tourism sustainability of a number of GIAHS heritage sites in conjunction with previous research results. And the sustainability framework was constructed to find the path of sustainable development. Literature [21] used literature, survey method and other methods to discuss the background and logic of the integrated development of Guizhou's “sports, tourism, culture, business and agriculture” industry and its impact on the innovative development of Guizhou's economy and society, and put forward the optimization path. Literature [22] used the panel data set of Guangxi counties and the PSM-DID method to explore the impact of the integrated development of agriculture and tourism on the growth of farmers' income. It reveals that the integrated development of agriculture and tourism is conducive to increasing farmers' income. Literature [23] explored the development of eco-agriculture economy, aiming to improve the rural ecological and cultural tourism environment, promote the development of eco-agriculture, improve the quality of life of the residents, and provide tourists with high-quality tourism services. Literature [24] emphasizes the importance of tourism for Italy and expects to prove the economic promotion of the integration and development of culture, agriculture, etc. with tourism, aiming to find new development paths to overcome the effects of the Italian economic crisis. Literature [25] examined the impact of the integration of culture and tourism on regional tourism economic efficiency based on the data of tourism and culture industry in Chinese provinces. The results pointed out that the level of integration of the two industries in China is low and shows large regional differences, and the Middle East is higher than the western region. It is also pointed out that measures such as promoting the deep integration of culture and tourism can help to improve the economic benefits of tourism. Literature [26] took Zezhou County as the research object, constructed a variety of development modes and mechanisms, and explored the organizational form of differentiation, convergence, and integration of agriculture, forestry, culture, and tourism in the big

health industry. Its findings are of practical significance in promoting the development of new forms and functions of industrial integration. Literature [27] takes Chaxi Village as an example, and summarizes the rural revitalization model of "taking agriculture as the carrier, culture as the core, and tourism as the engine". The positive impacts of the deep integration of agriculture, culture and tourism on various aspects of the countryside are also examined, with a view to providing references for the revitalization strategies of other agricultural villages. Literature [28] constructed the theoretical framework of "three integration and five systems" for the integration of rural culture and tourism from three aspects of resources, contents and scenes, as well as five systems of fertility, literature, industry, residence and community. Taking Xutun Village as an example, it summarizes its exploration of integration strategies in creating rural IP and promoting industrial development. It provides a reference for the integration and development of other rural culture and tourism.

This paper first establishes a comprehensive evaluation index system for measuring the integration effect of agriculture, culture and tourism in Yijun County based on the connotation and formation mechanism of the integration effect of agriculture, culture and tourism, and then establishes a model for measuring the integration of agriculture, culture and tourism industries. Then, based on the entropy weight-TOPSIS method, a series of indicators are constructed to measure the coupled and coordinated development level of agriculture, culture and tourism industry in Yijun County as the study area. Again, a spatial measurement model is constructed to reveal the reasons for the spatial differences in Yijun County, and finally 23 villages in Yijun County are selected, and the corresponding core explanatory variables are set from the factors of general budget inputs, fixed asset inputs, education expenditures, human inputs, facility inputs, etc., so as to excavate the influencing factors of the coupling and coordinated development of the culture and tourism industry through the spatial measurement model.

2. Methods for analyzing the integration effect of agricultural, cultural and tourism industries

2.1. Connotation and Measurement of the Integration Effect of Agriculture, Culture and Tourism

2.1.1. Connotation and formation mechanism of agriculture, culture and tourism integration effect：

1) Connotation of the integration effect of agriculture, culture and tourism. The integration effect of agriculture, culture and tourism studied in this paper specifically refers to a series of comprehensive effects produced by the mutual integration of agriculture, culture industry and tourism industry. This integration effect is reflected in practice as the mutual promotion, interpenetration and interdependence between agriculture, culture and tourism, as well as the formation of new industrial forms in the process. This new industrial form not only promotes the modernization and diversification of agriculture, but also provides new impetus and space for the development of cultural heritage and tourism. The connotation of the integration effect of agriculture, culture and tourism is reflected in many aspects, including industrial integration, economic benefits, social benefits and ecological benefits.

2) The formation mechanism of the integration effect of agriculture, culture and tourism. The formation mechanism of the integration effect of agriculture, culture and tourism involves the cross-fertilization of the three major fields of agriculture, culture and tourism, through which resource sharing, functional complementarity and value growth are realized, thus promoting the comprehensive development of the regional economy and society. Mainly through the following five aspects to realize the integration of agriculture, culture and tourism cross-development.

The formation of the integration effect of agriculture, culture and tourism is a complex systematic project, which requires the common role and mutual cooperation of various factors. Through the

mechanisms of resource integration, industrial interaction, market drive, policy support and ecological civilization construction, the integration of agriculture, culture and tourism can effectively promote the modernization of agriculture, cultural heritage and tourism development, and achieve the coordinated development of the economy, society and the environment.

2.1.2. Indicator system and model construction for measuring the integration effect of agriculture, culture and tourism:

1) The construction principle of the index system of the integration effect of agriculture, culture and tourism. Combined with the development of Yijun County, this paper analyzes the connotation and measurement logic of the high-quality development of agriculture, culture and tourism, and establishes a comprehensive evaluation index system for the integration effect of agriculture, culture and tourism. The accuracy of the indicator evaluation results directly affects the feasibility of the subsequent empirical analysis and related recommendations. Therefore, in order to ensure the scientificity and rationality of the indicator system, this paper follows the following principles: a. Comprehensiveness: the indicator system must take into account a number of aspects to ensure a comprehensive evaluation of the integration effect of agriculture, culture and tourism in Dongting Lake Eco-Economic Zone. b. Relevance: the indicators should be associated with the actual objectives and key performance indicators of the evaluated object, and the use of irrelevant or unimportant indicators should be avoided. c. Operability: The selected indicators must be easy to access, easy to calculate, and have strong data representativeness to accurately reflect the dimensions of each indicator. d. Hierarchical: Ensure that the indicator system is hierarchical and the indicators are clearly categorized in order to show the real and effective evaluation results. e. Scientific: The construction of the indicator system must be scientific and reasonable, in line with the development situation of the Yijun County region, and adequately reflect the connotation of the high-quality development of the integration of agriculture, culture and tourism. f. Scientific: The indicator system must be constructed in a scientific and reasonable manner. Overall, the selection of indicators should focus on innovation, taking into account the changes in the evaluation criteria of the integration effect of agriculture, culture and tourism, as well as conforming to the current measurement standards and considering the issue of historical continuity.

2) Confirmation of the indicator system of the integration effect of agriculture, culture and tourism. Based on the basic principles of the construction of the indicator system, and combining the connotation of the high-quality development of the integration of agriculture, culture and tourism, taking into account the availability of data, using the new development concept as a guide, and considering the input efficiency and output effect of the high-quality development of the integration of agriculture, culture and tourism as a whole, this paper constructs an indicator system to measure the level of the integration effect of the integration of agriculture, culture and tourism in the Yijun county area, and the system has a total of 3 first-level indicators, 7 second-level indicators and 29 third-level indicators [29]. The construction of the indicator system for measuring the integration effect of agriculture, culture and tourism is shown in Table 1.

Table 1. The nannan-style travel fusion effect measure system

Primary indicator	Secondary indicator	Tertiary index
Agriculture(A1)	Agricultural economy(A11)	The first production of GDP(A111)
		The number of agricultural and forestry fisheries(A112)
		Output of agricultural and forestry industry(A113)
		Total output of agricultural and forestry fisheries(A114)
	Agricultural	Total mechanical power of agricultural machinery(A121)

	resources(A12)	The number of families of agriculture, forest, pasture and fishery(A122)
		The number of workers in the farming and forestry fishery(A123)
		Crop planting area(A124)
		Total grain production (ton) (A125)
Culture(A2)	Cultural culture(A21)	The number of workers in the field: cultural and sports and entertainment(A211)
		Art mass(A212)
		The art troupe(A213)
		The rural public welfare film shows the field(A214)
		All kinds of literary and artistic activities of the year(A215)
	Immaterial culture(A22)	Intangible cultural heritage(A221)
	Material culture(A23)	The number of county-level theatres(A231)
		Library number(A232)
		The library is full of thousands of books(A233)
		Township cultural station(A234)
		The number of museums (museum and museum) (A235)
		Item/set of cultural relics(A236)
Travel(A3)	Tourist resources(A31)	Housing and food inventory(A311)
		The number of residential and catering companies(A312)
		Road mileage (km) (A313)
		Year-end employee (10,000) (A314)
		The number of tourist spots above 3a(A315)
	Tourism economy(A32)	Total number of tourists(A321)
		Tertiary GDP(A322)
		Passenger turnover(A323)

3) Comprehensive evaluation model of entropy weight-TOPSIS method. Comprehensive evaluation methods are widely recognized in the field of management science, among which the combined application of entropy weight method and TOPSIS method is particularly prominent. The entropy weight method assigns weights based on the information reflected in the indicator data, which helps to eliminate the influence of subjective factors on the weights [30-31]. The TOPSIS model, on the other hand, ranks the measurement objects by comparing their relative distances from positive and negative ideal solutions, and the evaluation results are objective and universal. In order to overcome the arbitrariness of subjective assignment and the one-sidedness of a single evaluation method, this paper adopts the entropy weight TOPSIS model to comprehensively measure the integration effect of agriculture, culture and tourism in Yijun County.

The following are the specific steps:

(1) Construction of a standardized evaluation matrix a. Construction of a standardized evaluation matrix 1.

Positive indicators:

Positive indicators:

$$y_{ij} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)} \tag{1}$$

Negative Type Indicator:

$$y_{ij} = \frac{\max(x_j) - x_{ij}}{\max(x_j) - \min(x_j)} \tag{2}$$

(2) Calculate the entropy value of each indicator in the evaluation system using the standardized indicator values H_j.

$$H_j = -\frac{1}{\ln(m)}\sum_{i=1}^{m} p_{ij}\ln(p_{ij}), p_{ij} = \frac{y_{ij}}{\sum_{i=1}^{m} y_{ij}} \tag{3}$$

(3) Calculate the weights of the indicators in the evaluation system W_j.

$$W_j = \frac{1-H_j}{n-\sum_{j=1}^{n} H_j} \tag{4}$$

(4) Construct a weighted evaluation matrix.

$$R = (r_{ij})_{n\times n}, r_{ij} = w_{ij} \times y_{ij} \tag{5}$$

(5) Calculate positive and negative ideal solutions.

Positive Indicators:

$$S^{+} = \left\{\max r_{ij}, i = 1,2,\cdots,m\right\} \tag{6}$$

Negative indicators:

$$S^{-} = \left\{\min r_{ij}, i = 1,2,\cdots,m\right\} \tag{7}$$

(6) Calculate the Euclidean distance to the positive and negative ideal solutions for each evaluation object.

$$Sd_i^{+} = \sqrt{\sum_{j=1}^{n}(S_j^{+} - r_{ij})^2}, i = 1,2,\cdots m \tag{8}$$

$$Sd_i^{-} = \sqrt{\sum_{j=1}^{n}(S_j^{-} - r_{ij})^2}, i = 1,2,\cdots m \tag{9}$$

(7) Calculate the relative closeness of each object to the ideal solution.

$$\eta_i = \frac{Sd_i^{-}}{Sd_i^{+} + Sd_i^{-}}, i = 1,2,\cdots m \tag{10}$$

Where $0 \le \eta_i \le 1$, η_i is closer to 1 indicates that the evaluation object is closer to the optimal level.

4) Data source and research scope. The focus of this paper is to cover 23 representative villages in Yijun County, and to further measure the effect of integration of agriculture, culture and tourism in Yijun County by using the relevant data from 2011 to 2023. The main sources of data for this paper are: a. Statistical bulletin on the development of each village. b. Statistical yearbook. c. China County Statistical Yearbook. d. Statistical Report on Analysis of Cultural and Tourism Development. e. Statistical Yearbook of Culture and Tourism. f. Markdata.org.

2.2. Yijun County Agriculture, Culture and Tourism Industry Integration Measurement Model Construction

2.2.1. Evaluation index of the level of development of the agro-cultural tourism industry:

1) Evaluation index of the level of development of cultural industries (C).

$$C(y)=\sum_{j=1}^{m}\omega_j\rho_{ij}(i=1,2,3,...,n;j=1,2,3,...,m) \tag{11}$$

In the formula, j is the number of indicator system of cultural industry $(j=1,2,3,...,m)$, ω_j is the weight of the jth indicator of cultural industry, ρ_{ij} is the standardized value of the jth indicator of cultural industry in the ith year. The larger the value $C(y)$, the higher the development level of the cultural industry in the region.

2) Evaluation index of development level of tourism industry (T).

$$T(x)=\sum_{j=1}^{m}\omega_j\rho_{ij}(i=1,2,3,...,n;j=1,2,3,...,m) \tag{12}$$

In the formula, j is the number of indicator system of tourism industry $(j=1,2,3,...,m)$, ω_j is the weight of the j th indicator of tourism industry, $\rho_i j$ is the standardized value of the j th indicator of tourism industry in the i th year. The larger the value $T(x)$, the higher the level of development of the tourism industry in the region.

3) Evaluation index of the development level of agricultural industry (A).

$$A(z)=\sum_{j=1}^{m}\omega_j\rho_{ij}(i=1,2,3,...,n;j=1,2,3,...,m) \tag{13}$$

In the formula, j is the number of indicator system of agricultural industry $(j=1,2,3,...,m)$, ω_j is the weight of the jth indicator of agricultural industry, $\rho_i j$ is the standardized value of the jth indicator of agricultural industry in the i th year. The larger the value $A(z)$, the higher the development level of the agricultural industry in the region.

2.2.2. Coupling harmonization model:

1) Coupling model. The coupling degree model is an important statistical analysis of the mutual influence and dependence of two or two and more systems. In this paper, the coupling degree model, which is widely used in the physical field, is introduced and used to measure the relationship between the cultural industry and the tourism industry [32]. On this basis, the coupling degree of agricultural, cultural and tourism industries in Yijun County area is calculated and assessed.

In the process of physics research, the initial coupling degree calculation method is shown below:

$$C_n=\left\{(U_1\cdot U_2\cdot U_3,\cdots,U_n)/\left[\prod(U_i+U_j)\right]\right\}^{1/n} \tag{14}$$

In the research of this paper, there are three subsystems, namely agricultural industry, cultural industry and tourism industry, so according to the above formula can be derived as follows for the calculation of the coupling degree of agricultural industry, cultural industry and tourism industry:

$$C=\sqrt{\frac{C(y)\cdot T(x)\cdot A(z)}{[C(y)+T(x)+A(z)]^2}} \tag{15}$$

In the formula, C represents the coupling degree of cultural industry and tourism industry, $0\le C\le 1$. $C(y)$ represents the evaluation index of the development level of cultural industry, $T(x)$ represents the evaluation index of the development level of tourism industry, and $A(z)$ represents the evaluation index of the development level of agricultural industry.

2) Coupling coordination degree model. In the research and analysis process of this paper, the coupling degree is only a measure of the development level of the two industries of agriculture, culture and

tourism, but it is not able to judge the degree of mutual integration between the two industries, nor is it able to judge the mutual coordination relationship between the two. Therefore, it is necessary to introduce the index of coupling coordination degree to measure and evaluate the agriculture, culture and tourism industry scientifically.

The formula for calculating the coupling coordination degree of the integrated development of agricultural industry, cultural industry and tourism industry is:

$$T = aC(y) + bT(x) + cA(z) \tag{16}$$

$$D = \sqrt{C \times T \times A} \tag{17}$$

3. Measurement and analysis of agricultural, cultural and tourism industry integration in Yijun county area

3.1. Determination of weights

Using the entropy value method, the weights of the indicators for measuring the level of development of cultural industry and tourism industry in Yijun county region from 2017 to 2023 are found. The weights of indicators for measuring the level of integration of agricultural, cultural and tourism industries in Yijun county region are shown in Table 2.

Table 2. Industrial integration level measure weight

Primary indicator	Secondary indicator	Tertiary index	Index weight
(A1)	(A11)	(A111)	0.0394
		(A112)	0.0207
		(A113)	0.027
		(A114)	0.018
	(A12)	(A121)	0.0104
		(A122)	0.0249
		(A123)	0.0023
		(A124)	0.0747
		(A125)	0.0472
(A2)	(A21)	(A211)	0.0495
		(A212)	0.0683
		(A213)	0.0229
		(A214)	0.0223
		(A215)	0.0296
	(A22)	(A221)	0.0652
	(A23)	(A231)	0.02
		(A232)	0.037
		(A233)	0.0506
		(A234)	0.0459
		(A235)	0.027
		(A236)	0.083
(A3)	(A31)	(A311)	0.0328
		(A312)	0.0421
		(A313)	0.0131
		(A314)	0.0512
		(A315)	0.0024
	(A32)	(A321)	0.055
		(A322)	0.0145
		(A323)	0.003

3.2. Coupling coordination degree calculation results and analysis

The weights of the above indicators are substituted into the coupling coordination degree model for measurement, which results in the comprehensive evaluation indexes (F1, F2 and F3) and the integration coordination degree (D) of Yijun County's regional agricultural industry, tourism industry and cultural industry from 2017 to 2023. The coupling and coordination grade of agricultural, cultural and tourism industries in Yijun County region is shown in Table 3. From the table, the following conclusions can be drawn: from 2017-2023 Yijun county domain agriculture industry, tourism industry and cultural industry development level change trend: from the analysis of the overall development trend of the agricultural industry, the trend of the development level of the agriculture, culture and tourism in 2017-2023 was generally upward, and the agriculture industry had the highest growth in 2022-2023. The cultural industry showed a small decline in 2021.

From 2017-2023, the development level of agricultural industry, tourism industry and cultural industry in Yijun County region: in 2017 and 2022, the development level of cultural industry in Yijun County region obviously lags behind the development level of agricultural industry and tourism industry.In 2018, 2020 to 2021, the development level of tourism industry in Yijun County region

obviously lags behind the development level of agricultural industry and cultural industry. In 2019 and 2023, the development level of agricultural industry in Yijun County region obviously lags behind the development level of tourism industry and cultural industry.

From 2017-2023, the integration and coordination degree (D) of agricultural industry, tourism industry and cultural industry in Yijun county region: the integration and coordination level of tourism industry and cultural industry in Yijun county region gradually improves, and the integration and coordination level of agricultural industry, tourism industry and cultural industry in 2017 is seriously out of order, and develops to the mildly coordinated state in 2023, and the coordination relationship tends to get better year by year.

To summarize, with the change of time, the value of the coupling coordination degree of agricultural industry, tourism industry and cultural industry in Yijun County is getting higher and higher, and the overall trend of the integrated development of agricultural, cultural and tourism industry in Yijun County is showing a positive trend. In addition, from the empirical analysis of big data, it can be found that, along with the tourists' aesthetic ability and the increasing level of cultural awareness, the traditional form of cultural tourism has been unable to meet the growing demand for cultural tours, and in the process of modern development, the supply capacity of Yijun County to the current cultural commodities and tourism market has been unable to adapt to the market demand, so Yijun County has to be promoted by market demand, and continuously realize the development of the agricultural, cultural and tourism industries. Therefore, Yijun County must be driven by the market demand, and continuously realize the further enhancement of the commodity form and industrial function of the culture and tourism industry, so as to create a series of cultural commodities and tourism industry that can meet the needs of tourists, and thus vigorously promote the development of Yijun County's agriculture industry, culture industry and tourism industry and deepen the coupling interaction between the two sides.

Table 3. Coupling coordination level

Year	2017	2018	2019	2020	2021	2022	2023
F1	0.015	0.0422	0.0511	0.0729	0.0722	0.118	0.1625
F2	0.0078	0.0218	0.772	0.0781	0.079	0.1044	0.1298
F3	0.0065	0.0362	0.0522	0.0745	0.083	0.1162	0.1236
Development type	Culture lag	Tourist lag	Agricultural lag	Tourist lag	Tourist lag	Culture lag	Agricultural lag
D	0.099	0.175	0.25	0.268	0.297	0.331	0.342
Coordination level	Severe disorder	Severe disorder	Moderate disorder	Moderate disorder	Moderate disorder	Mild disorder	Mild disorder

4. Spatial measurement modeling

4.1. Spatial weight matrix setting

In order to solve the biased measurement results caused by ignoring the spatial spillover effect and spatial dependence between regions, this paper constructs a spatial measurement model to identify the direct impact of new urbanization on the level of regional high-quality development, and setting the spatial weight matrix is the basis for constructing the spatial measurement model. In this paper, the classic 0-1 adjacency matrix and inverse distance matrix are selected for analysis. 0-1 adjacency matrix is set in such a way that if two regions are adjacent, the corresponding value in the weight matrix is assigned as 1, otherwise it is assigned as 0. The inverse distance-based weighting matrix assumes that the intensity of spatial effects depends on distance, and that the effect of all regions other than the region itself on the region decreases with increasing distance, in accordance with the first law of geography. Meanwhile, the inverse distance-based form of weight matrix setting can transform the

non-sparse matrix into a sparse matrix, thus solving the problem of long model running time when the number of research units is too large. Therefore, the inverse distance form is chosen as the second spatial weight matrix setting method to enhance the robustness of the research results.The specific forms of 0-1 adjacency matrix and inverse distance matrix are shown in Eqs. (18) and (19), respectively.

$$W_{ij} = \begin{cases} 1 & i \in (j) \\ 0 & i \notin (j) \end{cases} \tag{18}$$

$$W_{ij} = \begin{cases} 1/d_{ij} & i \neq j \\ 0 & i = j \end{cases} \tag{19}$$

Since the data used in this paper are panel data, it is necessary to extend the spatial weight matrix into a spatio-temporal weight matrix, which is set as follows:

$$W_N = I_t \otimes W_n \begin{bmatrix} W_{n\times n} & 0_{n\times n} & \cdots & 0_{n\times n} \\ 0_{n\times n} & W_{n\times n} & \cdots & \cdots \\ \cdots & \cdots & \cdots & 0_{n\times n} \\ 0_{n\times n} & \cdots & 0_{n\times n} & W_{n\times n} \end{bmatrix}_{N\times N} \tag{20}$$

where $N = t \cdot n$. $\otimes$ is the Kronecker product.

4.2. Spatial autocorrelation analysis

The value of global $Moran's\ I$ is in the range of [-1, 1], with positive values indicating positive spatial correlation in the level of high-quality development between regions and negative values indicating negative spatial correlation in the level of high-quality development between regions. The formula for $Moran's\ I$ is:

$$I = \left[n\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}(x_i - \bar{x})(x_j - \bar{x}) \right] / \left[\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij} \sum_{i=1}^{n} (x_i - \bar{x})^2 \right] \tag{21}$$

where n is the number. W_{ij} is the spatial weight, x and $\bar{x}$ are the regional high-quality development level and regional high-quality development water average, respectively. In order to strengthen the stability of the test results, this paper measures the regional high-quality development level $Moran's\ I$ under the two matrix forms of 0-1 adjacency matrix and inverse distance matrix respectively.

The regional high-quality development level $Moran's\ I$ is positive, and although its value fluctuates, regardless of which form of spatial weight matrix is used, the regional high-quality development level $Moran's\ I$ in each year passes the 1% significance test, indicating that the regional high-quality development level has a significant positive spatial autocorrelation characteristics, which is specifically reflected in the clustering of cities with higher high-quality development level. Given that the regional high-quality development level shows spatial autocorrelation, the spatial factor cannot be ignored when studying its influencing factors.

4.3. Spatial measurement modeling

4.3.1. Selection of variables. The explanatory variable in this chapter is the level of high-quality development. The explanatory variables selected in this paper are: general budget expenditure, human input, basic input, fixed input, and education, which are all five indicators that are closely linked to the agro-cultural tourism industry and the bottleneck of the coupling of the agro-cultural tourism industry. General budget expenditure (GOV), in billions of dollars. Measuring the regional budget expenditure,

generally speaking, the level of economic development has a positive correlation with the general budget expenditure, the higher the level of development, the higher the general budget expenditure, the higher the budget expenditure per capita, which better reflects the level of rural economic development. Human capital (L), measured in terms of the number per 10,000 people. The higher the economic and cultural level, the higher the human capital, which encourages a region to optimize its economic structure and improve productivity. Infrastructure Development (FND), measured in millions of dollars. Measures the status of regional infrastructure investment, such as water, electricity, road infrastructure and other services, to provide the basic power for the effective development of the cultural tourism industry, well-developed transportation, residential comfort, and good support for the local tourism industry will be more developed. Fixed Inputs (K), in millions of dollars. Measures the total value of fixed assets in the region, including real estate, construction, machinery, means of transportation, etc. The higher the GDP, the higher the investment in fixed assets. Education Expenditure (EDU), in millions of dollars. Measures the level of regional education investment, education investment directly affects human capital, related to the level of technology and the strength of future development, is an important indicator of a city's control variables are described as shown in Table 4.

Table 4. Control variable specification

Variable name	Symbol
General Budget Expenditure	InGOV
Human Input	InL
Basic Input	InFND
Fixed Input	InK
Education	InEDU

4.3.2. Regression modeling and spatial measurement modeling. Based on the theoretical analysis and research hypotheses, the following regression model is set up in this chapter:

$$H_{it} = \alpha_0 + \alpha_1 U_{it} + \alpha_2 \ln Fd_{it} + \alpha_3 \ln Inform_{it} + \alpha_4 \ln Pd_{it} + \alpha_5 \ln GDP_{it} + f_i + f_t + \varepsilon_{it} \tag{22}$$

In this chapter, on the basis of testing the spatial autocorrelation of regional high-quality development level, the regression coefficients are further identified using spatial econometric models, which have various forms, including spatial lag model (SAR), spatial error model (SEM) and spatial Durbin model (SDM). The basic form of spatial econometric model set in this paper is as follows:

$$Y = \rho WY + X\beta + \theta WX + \mu \tag{23}$$

$$\mu = \lambda W\mu + \varepsilon, \varepsilon \sim N\left[0, \sigma^2 I\right] \tag{24}$$

Where Y is the explanatory variable, i.e., the level of high-quality development. X represents all explanatory variables. W is the spatial weight matrix. β is the correlation coefficient of explanatory variable X. ρ and θ are the spatial correlation coefficients. λ is the spatial error coefficient. μ and ε represent random errors.

5. Empirical analysis of the factors affecting the coupled development of agricultural, cultural and tourism industries in Yijun county area

5.1. Benchmark regression test

The results of the benchmark regression analysis are shown in Table 5, with an R-squared of 0.462, and the contributions of general budget, manpower, basic input, fixed input, and education are positive,

with different degrees of promotion to the level of coupled and coordinated development of agricultural, cultural, and tourism industries in Yijun County. The correlation coefficient of government investment is 0.052, with positive correlation promotion effect. The correlation coefficient of human capital is 0.005, with positive correlation and promotion effect. The correlation coefficient of infrastructure is 0.15, with a positive correlation and promotion effect. The correlation coefficient of fixed assets is 0.458 with positive correlation and significant at p-value = 0.01. The correlation coefficient of education investment is 0.45 with positive correlation and significant at p-value = 0.05.

Table 5. Benchmark regression analysis results

y	Coefficient	Standard error	T statistic	P value
InGOV	0.052	0.189	0.32	0.765
InL	0.005	0.065	0.1	0.923
InFND	0.15	0.093	1.36	0.195
InK	0.458	0.076	6.42	0.000***
InEDU	0.45	0.182	2.55	0.013**
Constant	2.341	1.362	1.78	0.09*
Mean dependent var	3.055	SD dependent var	1.285	
R-squared	0.462	Number of obs	496	
F-test	83.426	Prob>F	0	
Akaike crit.(AIC)	1362.52	Bayesian crit.(BIC)	1385.621	

5.2. Spatial autocorrelation test

The 23 villages in the Yijun county area are spatially and geographically connected, and the benchmark regression model is used to test the panel data before constructing a correlation econometric model to analyze the correlation. The spatial relationship of Moran index is shown in Table 6. Spatial autocorrelation can be interpreted as geographically close regions having correlated values. If all higher values or lower values are together, it is a “positive correlation”. A “negative correlation” occurs if higher and lower values, and lower and higher values, interact.

Table 6. Spatial relation of the moran index

quadrant	Core region	Surrounding area	Correlation degree
First quadrant	High value	High value	large
Second quadrant	Lower value	High value	small
Third quadrant	Lower value	Lower value	large
Fourth quadrant	High value	Lower value	small

The global Moran's index of the coupled and coordinated development level of agriculture, culture and tourism industry is shown in Table 7. Taking the 23 villages in Yijun county area as the research object, the 13-year panel data from 2011-2023 are intercepted and the global Moran's I index is calculated, and the Moran's index from 2011 to 2023 has no obvious pattern and shows an up-and-down fluctuation trend, with the Moran's index in 2011 as 0.199, the Moran's index in 2023 is 0.289, the highest is in 2013 with a Moran's index of 0.293, and the lowest is in 2020 with a Moran's index of 0.177.

Table 7. Global moran index

Variables	I	Z value	P value
2011	0.199	1.8	0.045

2012	0.265	2.432	0.007
2013	0.293	2.46	0.01
2014	0.28	2.479	0.009
2015	0.213	2.001	0.024
2016	0.2	1.902	0.02
2017	0.211	1.931	0.041
2018	0.178	1.883	0.029
2019	0.204	1.843	0.034
2020	0.177	1.796	0.04
2021	0.186	1.73	0.04
2022	0.184	1.715	0.037
2023	0.289	2.458	0.005

The Moran scatter plots of the coupling and coordination levels of agriculture, culture and tourism industries in 23 villages in Yijun County in 2011 and 2023 are shown in Figs. 1 and 2. The Moran index in 2011 is 0.195, and the scatter plot is roughly in the southwest-northeast direction, and the fit of some villages is not good, which may be due to differences in the endowment of tourism resources.The Moran index in 2023 is 0.276, and the fit is better than that in 2011, and the scatter plot is roughly in the southwest-northeast direction. 0.276, the scatter plot is roughly southwest-northeast direction, the fit is better than in 2011.

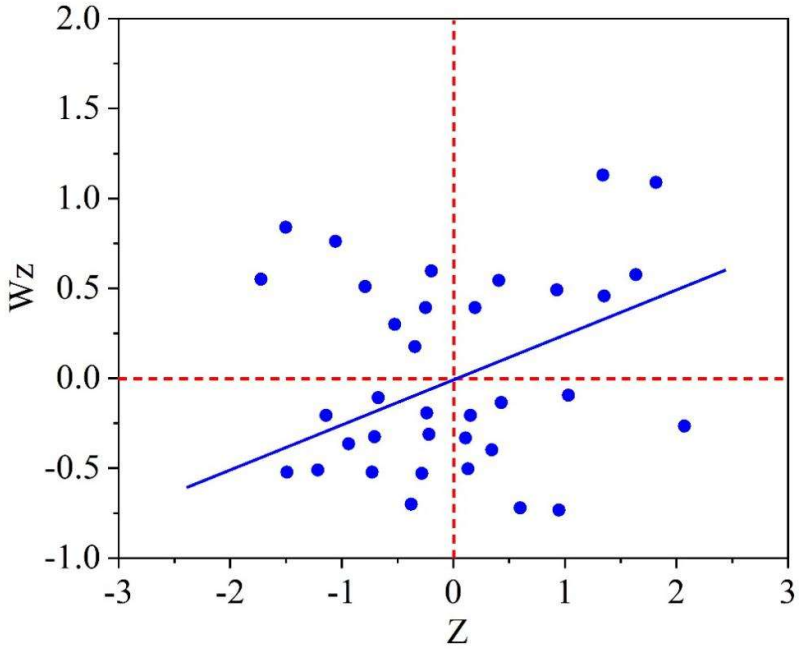

Fig. 1. In 2011, the industry coupling coordination level

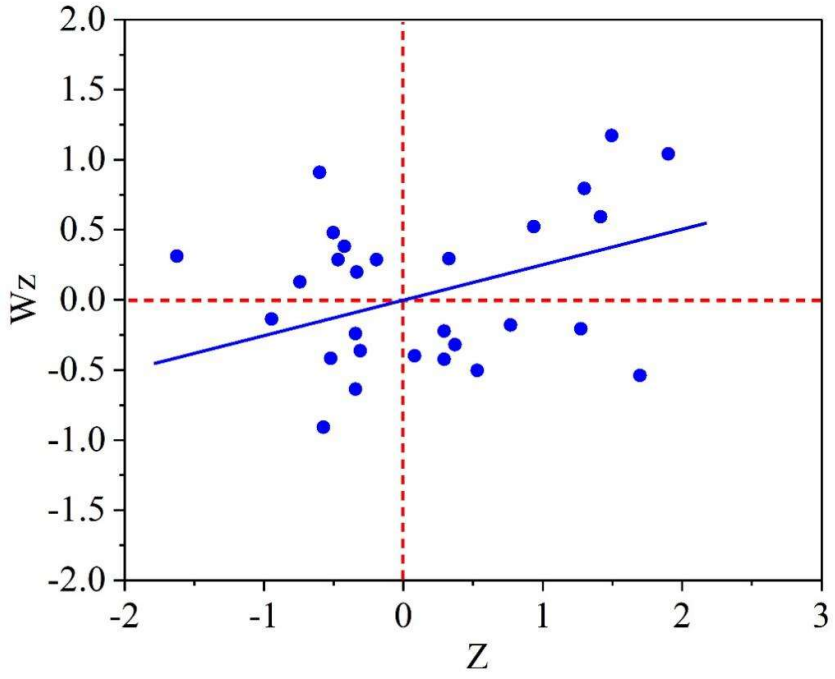

Fig. 2. In 2023, the industry coupling coordination level

5.3. Robustness test and selection of spatial placement models

This paper involves fewer years of data, no other tests are needed, the results of Hausman measure are used to further consider the choice of fixed or random, if the original hypothesis is rejected, the fixed effect model is chosen, and vice versa. Hausman test is shown in Table 8. According to the results of Hausman test, the p-value is 0.00, the original hypothesis is rejected, and fixed effect is selected for spatial econometric modeling analysis.

Table 8. Hausman test

Hausman test data	Freedom	P value
34.63	5	0.000

The specific model chosen to analyze the factors influencing the level of the 23 villages in Yijun County area also needs to be tested by Wold's test, and if rejected, Durbin is chosen, and if not rejected, lag is chosen. If the second one is not rejected, the error is selected. The Wald test and Lagrange multiplier test are shown in Table 9. The test on the panel data of 23 villages from 2011-2023 can be found that all of them are in the state of rejection, so the construction of Durbin is chosen to analyze the spatial econometric model.

Table 9. The wald test and the Lagrangian subtest

Likelihood-ratio test (Assumption: sar nested in sdm)	Calorie statistic=78.59
	P value=0.0000
Likelihood-ratio test (Assumption: sem nested in sdm)	Calorie statistic=33.85
	P value=0.0000

5.4. Empirical analysis of the spatial Durbin model

According to the previous analysis, it can be seen that there is spatial autocorrelation in the level of coupled and coordinated development of agricultural, cultural and tourism industries in Yijun County, and the correlation model will be used in this paper for estimation. Sample data time = 13 years, village

= 23, using STATAL software to analyze, indicating that there is indeed a spatial positive correlation. The spatial Durbin model results are analyzed as shown in Table 10 (***p<0.01, **p<0.05, *p<0.1). From the table, it can be seen that the coefficient of local area influence and spatial spillover coefficient of time-fixed are greater than that of individual fixed and time-fixed, so the time-fixed model is selected for analysis. Under the time-fixed model, the home region correlation of general budget expenditure, human capital, infrastructure construction and fixed asset investment is 0.211, 0.03, 0.082 and 0.085 respectively at the significant level of 0.01, and the home region correlation of education investment is 0.211 at the significant level of 0.1, which is more significant overall than the random effect, the individual fixed effect, and the two-way fixed effect. Next, this paper will compare the direct and indirect perspectives. The direct impact aspect refers to the impact of the evidence-seeking factors on the city itself, and the indirect impact aspect refers to the impact of the evidence-seeking factors on neighboring cities.

Table 10. Spatial dubin model results

	Random effect		Time fixed		Individual fixation		Bidirectional fixation	
VAR	Local influence coefficient	Spatial overflow coefficient	Local influence coefficient	Spatial overflow coefficient	Local influence coefficient	Spatial overflow coefficient	Local influence coefficient	Spatial overflow coefficient
InGOV	0.062***(0.037)	-0.002(0.056)	0.211***(0.011)	0.269***(0.007)	0.045***(0.033)	0.015(0.026)	0.036**(0.059)	-0.042*(0.059)
InL	0.022***(0.047)	-0.023*(0.008)	0.036***(0.04)	0.072***(0.035)	0.028***(0.046)	-0.024**(0.021)	0.013*(0.044)	0.058***(0.024)
InFND	-0.039(0.046)	0.026(0.023)	0.082***(0.02)	-0.002(0.012)	-0.078**(0.012)	0.062(0.053)	0.095***(0.056)	-0.042(0.053)
K	0.015*(0.007)	-0.003(0.026)	0.085***(0.012)	0.004(0.014)	0.007(0.014)	-0.001(0.017)	0.008(0.006)	-0.012(0.035)
EDU	0.032**(0.013)	0.085***(0.041)	0.092*(0.016)	0.158*(0.048)	0.033***(0.043)	0.088***(0.049)	0.026**(0.035)	0.036(0.037)

The effect decomposition of factors affecting the coupled and coordinated development of agriculture, culture and tourism industry is shown in Table 11 (***p<0.01, **p<0.05, *p<0.1). From the table, it can be seen that the general budget expenditure is positively related to the level of agricultural, cultural and tourism industry in Yijun County, and the coefficient of this region is 0.218. In the direct effect, for every point of increase in the general budget expenditure, the level of agricultural, cultural and tourism industry in this city increases by 0.195 points. It is not significant in the indirect effect. The financial expenditure includes several expenses such as capital construction, so increasing the general budget expenditure in Yijun County can improve the production capacity of the countryside, promote the structural upgrading of the agricultural, cultural and tourism industry in Yijun County, as well as have more funds to invest in talents and technology, improve the efficiency of the use of resources, promote the benign cycle of the economy, improve the level of coordination of the coupled agricultural, cultural and tourism industries in Yijun County, and promote the coupled development of the agricultural, cultural and tourism industries.

Through the relevant data of Yijun county cultural and tourism industry from 2011 to 2023, the baseline regression test model was constructed to verify the correlation of each influencing factor, and then the spatial correlation that exists in the level of coupled and coordinated development of cultural and tourism industry in Yijun county was verified by using Moran's scatterplot. With this as the premise, the relevant models are compared through Hausmann test, maximum likelihood value test, and Wald test to select the best model. Finally, the spatial Durbin model is taken as the optimal choice,

and the spatial adjacency weight matrix is applied to analyze the influence on the level of cultural and tourism industry in Yijun county area from five aspects: general budget, fixed input, human input, education input, and basic input. The results show that the level of coupled and coordinated development of cultural and tourism industry in Yijun county cities is not only affected by local factors, but also affected by neighboring cities due to spatial spillover effects and indirect effects, so spatial factors should be taken into account while studying the level of coupled and coordinated development of cultural and tourism industry in Yijun county cities. General budget, fixed inputs, human inputs, education inputs, and basic inputs all have obvious positive direct effects, and basic inputs, fixed inputs, and education inputs have positive effects on their neighboring regions.

Table 11. The effect of the influence factors of the development of the development

Variable	Local influence coefficient	Spatial overflow coefficient	Direct effect	Indirect effect	Total effect
InGOV	0.218***(0.059)	-0.265***(0.029)	0.195***(0.083)	-0.258***(0.027)	-0.062(0.019)
InL	0.035***(0.089)	-0.073***(0.047)	0.036**(0.021)	-0.082***(0.05)	-0.045(0.067)
InFND	0.082***(0.045)	-0.001(0.032)	0.082***(0.06)	0.029(0.017)	0.102(0.079)
K	0.089***(0.016)	0.005(0.076)	0.088***(0.072)	0.043(0.063)	0.128***(0.047)
EDU	0.092*(0.069)	0.159*(0.035)	0.102**(0.047)	0.236**(0.052)	0.346***(0.061)
Observations	492	492	492	492	492
R-Squared	0.683	0.683	0.683	0.683	0.683
Number Of Id	33	33	33	33	33

6. Conclusion

The article firstly constructed the index system for assessing the development level of agriculture, culture and tourism industries, and combined with the entropy value method to weight the indexes in the index system to get the evaluation indexes of the development level of agriculture industry, culture industry and tourism industry. Secondly, the spatial measurement model of agriculture, culture and tourism industry was constructed, and the factors affecting the coupled development of agriculture, culture and tourism industry in Yijun County were analyzed.

Through the coupling coordination degree model to calculate the comprehensive evaluation index of agriculture, culture and tourism industry and the integration coordination degree in Yijun County region from 2017 to 2023, it was found that the trend of the development level of agriculture, culture and tourism in 2017-2023 was generally upward, among which, the culture industry showed a small decline in 2021.

The benchmark regression analysis yields an R-squared value of 0.462, and the contribution of general budget, manpower, basic inputs, fixed inputs, and education to the coupled and coordinated development level of the agricultural, cultural and tourism industries in Yijun County is positive, with different degrees of promotion.

By using the spatial Durbin model to analyze the relevant data of Yijun County Regional Culture and Tourism Industry from 2011 to 2023, it is found that the coefficient of the general budget expenditure and the level of Yijun County Regional Agriculture, Culture and Tourism Industry is 0.218, which is positive.

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References

[1] PAN, Q. L., SONG, Y. Q., CHEN, L., & PAN, Z. K. (2021). The spatial pattern and influencing factors of county-scale tourism efficiency in Shaanxi province. Journal of Natural Resources, 36(4), 866-878.

[2] Guo, Y., & Cao, Z. (2024). A study on the tourism efficiency of tourism destination based on DEA model: A case of ten cities in Shaanxi province. Plos one, 19(1), e0296660.

[3] Fan, T., & Xue, D. (2020). Spatial correlation of cultural industry and tourism industry in Shaanxi Province, China: LISA analysis based on coordination model. Asia Pacific Journal of Tourism Research, 25(9), 967-980.

[4] Fan, B., & Li, J. (2022). Sustainable Development Path of Agriculture, Culture and Tourism Industry Under the Background of Rural Revitalization Strategy–Taking Jiangxi Province as an Example. In Proceedings of the 3rd International Conference on Green Energy, Environment and Sustainable Development (GEESD2022) (pp. 838-844). IOS Press.

[5] Zhang, Y., Zheng, Q., Tang, C., Liu, H., & Cui, M. (2024). Spatial characteristics and restructuring model of the agro-cultural heritage site in the context of culture and tourism integration. Heliyon, 10(9).

[6] Wang, J., Zhou, F., Xie, A., & Shi, J. (2024). Impacts of the integral development of agriculture and tourism on agricultural eco-efficiency: A case study of two river basins in China. Environment, Development and Sustainability, 26(1), 1701-1730.

[7] Adom, D., Alimov, A., & Gouthami, V. (2021). Agritourism as a preferred travelling trend in boosting rural economies in the post-COVID-19 period: Nexus between agriculture, tourism, art and culture. Journal of Migration, Culture and Society, 1(1), 7-19.

[8] Immacolata, V. (2018). Agriculture, Rural Tourism and Circular Paradigm. Quality-Access to Success, 19.

[9] Liu, Y. (2019). Cognitive diagnosis of cultural and rural tourism convergence. Translational neuroscience, 10(1), 19-24.

[10] Berno, T., Wisansing, J. J., & Dentice, G. (2020). Creative agritourism for development: Putting the 'culture'into agriculture in Thailand. In Tourism and Development in Southeast Asia (pp. 197-213). Routledge.

[11] Pavić, L., Pažek, K., & Pavlovič, M. (2018). Agritourism. between agriculture and tourism. a review. MODERN MANAGEMENT TOOLS AND ECONOMY OF TOURISM SECTOR IN PRESENT ERA, 243.

[12] Gia, B. H. (2021). Some solutions for sustainable agricultural tourism development in the Mekong Delta in Vietnam. In E3S Web of Conferences (Vol. 234, p. 00063). EDP Sciences.

[13] Voinova, N., Arcibashev, D., Aliushin, R., & Malina, V. (2019). Interaction of agricultural and ethnographic tourism for the development of Russian regions. Journal of Cultural Heritage Management and Sustainable Development, 9(2), 247-262.

[14] Shen, S., Wang, H., Quan, Q., & Xu, J. (2019). Rurality and rural tourism development in China. Tourism Management Perspectives, 30, 98-106.

[15] Tang, M., & Xu, H. (2023). Cultural integration and rural tourism development: A scoping literature review. Tourism and Hospitality, 4(1), 75-90.

[16] Fang, L., Liu, Z., & Jin, C. (2023). How does the integration of cultural tourism industry affect rural revitalization? The mediating effect of new urbanization. Sustainability, 15(14), 10824.

[17] Sun, B., Wang, G., & Liu, Y. (2023). Leisure agriculture and rural tourism benefit analysis on eco-environmental resource use. Sustainability, 15(10), 7930.

[18] Wang, J., Zhou, F., & Xie, A. (2022). The impact of integrated development of agriculture and tourism on rural ecological environment quality. Wireless Communications and Mobile Computing, 2022(1), 6113324.

[19] Qiu, P., Zhou, Z., & Kim, D. J. (2021). A new path of sustainable development in traditional agricultural areas from the perspective of open innovation—a coupling and coordination study on the agricultural industry and the tourism industry. Journal of Open Innovation: Technology, Market, and Complexity, 7(1), 16.

[20] Yehong, S. U. N., Yuxin, S. O. N. G., Yuexin, C. H. E. N., Cancan, Y. A. O., & Wenhua, L. I. (2021). Sustainable or not? Tourism development in agricultural heritage sites. Journal of resources and ecology, 12(4), 543-554.

[21] Yang, Y. (2022). Research on the Path of" Sports, Tourism, Culture, Commerce and Agriculture" Industrial Integration Development in Guizhou. The Educational Review, USA, 6(12), 801-806.

[22] Luo, Y., Xiong, T., Meng, D., Gao, A., & Chen, Y. (2023). Does the Integrated Development of Agriculture and Tourism Promote Farmers' Income Growth? Evidence from Southwestern China. Agriculture, 13(9), 1817.

[23] Sun, Y. (2020). Eco-agricultural economic development strategy based on improving the eco-cultural tourism environment in rural areas along the coast. Journal of Coastal Research, 104(SI), 648-651.

[24] Calabrò, G., & Vieri, S. (2018). Cultural and rural tourism: potential synergies for a new economic development pattern. The Italian case. Cactus Tourism Journal, 18, 27-35.

[25] Bai, Y. (2021). The impact of the integration of culture and tourism industry on the upgrading of tourism industry performance. Journal of Landscape Research, 13(5), 93-102.

[26] Wenlei, W. A. N. G., & Qian, L. I. (2022). The Integrated Development Mode and Mechanism of Agriculture, Forestry, Culture, Tourism and Health Industry from the Perspective of New Industry Form and New Function——Taking Zezhou County of Shanxi Province as an Example. Journal of Agriculture, 12(5), 70.

[27] Bin, S. (2023). Exploration on the Development Path of Agricultural, Cultural and Tourism Industry Integration Under the Background of Rural Revitalization: A Case Study of Chaxi Village, Hongjiang City, Hunan Province. Frontiers in Business, Economics and Management, 11(2), 22-27.

[28] Lin, L., Zhao, X., & Lyu, Z. (2024, August). Development Strategies for Integrating Rural Culture and Tourism in Liaoning Province: A Three Integration and Five Systems Approach. In 2024 International Conference on Culture-Oriented Science & Technology (CoST) (pp. 141-145). IEEE.

[29] Ruilin Cheng,Mingyang Wu,Xilei Liu,Xueqi Song & Yiwei Zhang. (2024). Research on the Measurement and Improvement Strategy of Integration of Agriculture, Culture and Tourism in Hebei Province Under the Strategy of Rural Revitalization. Advance in Sustainability(1).

[30] Qi Zhang,Zhihong Lu,Shanshan Jing,Dong Guo & Lijun Wang. (2024). Comprehensive evaluation of the implementation of close-type county medical alliance in Shandong Province using entropy weight TOPSIS method and non-integer rank sum ratio method. BMC Health Services Research(1),1193-1193.

[31] Yuwen Xu. (2024). Evaluation of iQiyi Financial Pressure Based on Entropy Weight -TOPSIS Method. International Business & Economics Studies(4),

[32] Dandan Shao,KyungJin Zoh & Yanzhao Xie. (2024). The spatial differentiation mechanism of intangible cultural heritage and its integration with tourism development based on explainable machine learning and coupled coordination models: a case study of the Jiang-Zhe-Hu in China. Heritage Science(1),414-414..