

Coupling Analysis of Tourism Development and Rural Revitalization in Yannanfei Tea Field Resort of Guangdong Province

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Abstract By deconstructing the dimensions of rural tourism and rural revitalization and constructing a coupled conceptual model, a coupled evaluation model is constructed. Yannanfei Tea Field Resort in Guangdong is taken as a research case for empirical analysis, to explore the coupled development trend of the two. The results show that ① the tourism development of Guangdong Yannanfei Tea Field Resort has a good synergistic relationship with rural revitalization. The two complement and promote each other, and rural tourism has significantly promoted the development of rural revitalization. ② The coupling development of tourism development and rural revitalization in Guangdong Yannanfei Tea Field Resort is divided into coupling imbalance period and coupling coordination period. The results indicate that the coordination between the two has not yet reached a level of good coordination and high-quality coordination. It is recommended that the resort should fully utilize the opportunity of rural revitalization strategy, increase investment in rural tourism, promote the transformation and upgrading of the resort, impel the integration of tea and tourism, and develop new business model of tea-tourism rural vacation.

Keywords Guangdong Yannanfei Tea Field Resort, Coupling analysis, Rural revitalization

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The “Rural Revitalization Strategy” is a major strategic national policy proposed in the report of the 19th National Congress of the Communist Party of China. It is an important content proposed by China based on achieving the great goal of the “Two Centenaries” during the decisive period of building a moderately prosperous society in all respects^[1]. The rural revitalization strategy specifically includes the revitalization of rural industries, the revitalization of rural talents, the revitalization of rural culture, the revitalization of rural ecology, and the revitalization of rural organizations. Among them, industrial revitalization is an important foundation for rural revitalization. Rural tourism is a modern service industry developed on the basis of agricultural production and planting, which is an important way for the rural revitalization and industrial revitalization. The landscape of agricultural production, participatory experiences in agricultural production activities, and science popularization education of agricultural culture are all important contents of rural tourism development. The successful development of rural tourism relies on the healthy development of agriculture, and the development of rural tourism is the development of the multi-functional value attributes of agriculture^[1]. The comprehensive and interconnected nature of the tourism industry determines that the response of rural tourism to the implementation of the rural revitalization strategy is not one-way or passive, but has a two-way mechanism and close internal connections^[2].

In the new era, increasing farmers’ income not only affects the improvement of their living standards, but also concerns the fundamental position of agriculture. Rural tourism is an effective way to increase farmers’ income within rural areas and outside agriculture. On the one hand, the added value of experience economy and service labor has significantly increased the labor value of agricultural products, and achieved an increase in the added value of agricultural products. On the other hand, the local consumption of rural tourism further reduces the storage and transportation costs and transaction risks in agricultural product transactions, allowing the income of agricultural products to be directly converted into the income of farmers^[1]. It can effectively promote the adjustment and optimization of the industrial structure of traditional rural agriculture by developing new forms of business such as rural homestays, agricultural leisure tourism, fruit and vegetable picking, forest health preservation, and leisure vacations^[3].

Guangdong Yannanfei Tea Field Resort was established in 1995, located in Yanyang Town, Meixian County, Meizhou City, 35 km away from the city center, covering an area of 453 hm². It is a tea field resort with beautiful scenery and rich tourism resources, and is located at the foot of Yinna Mountain, a famous scenic spot in eastern Guangdong^[4]. But now, due to its long construction time, the resort’s products and facilities cannot adapt to the upgrading of leisure vacation needs in the new era, resulting in a

large gap in customer consumption. At present, the resort mainly relies on natural resources in mountainous areas, and its entertainment and service facilities are outdated. In this paper, Guangdong Yannanfei Tea Field Resort, a representative traditional rural resort, is selected as the research subject. It aims to explore how to promote the transformation and upgrading of Yannanfei Tea Field Resort under the background of rural revitalization strategy, so as to integrate rural revitalization and rural leisure vacation for development.

1 Hypothesis of the coupling relationship between tourism industry and rural revitalization in Yannanfei Tea Field Resort

Existing scholars have pointed out that there is a coupling relationship between rural tourism and rural economy, mainly manifested in two aspects. ① Rural tourism will promote the development of rural economy from aspects such as rural tourism income, total number of rural tourism receptions, per capita expenditure on rural tourism, number of rural tourism attractions, investment in rural tourism infrastructure, and number of rural tourism consulting service centers^[5]. ② Rural areas provide a carrier for rural tourism, and rural revitalization provides a good natural ecological environment and strong economic support for the healthy development of rural tourism. Therefore, there is a deep coupling effect between rural revitalization and rural tourism development. The two

have a coordinated and consistent development direction, promoting each other^[6]. Taking Wuyuan of Jiangxi as an example, Lu Xiaojing et al.^[7] verified that there is a clear interactive coupling relationship, mutual influence, and interaction between the two systems of beautiful countryside and rural tourism. Based on the perspective of rural revitalization, Wang Changsen et al.^[8] analyzed the mechanism of the coupling and coordinated development of beautiful countryside and rural tourism, and constructed a coupling indicator system and coupling coordination model for the two.

Yannanfei Tea Field Resort is located in Yanyang Town, Meixian County, Meizhou City, Guangdong Province. It is situated at the foot of the Yinna Mountain, a famous scenic spot in eastern Guangdong. The resort is surrounded by mountains and shrouded in clouds all year round. It is a typical hilly area with deep and fertile soil and abundant rainfall. The vegetation belongs to central subtropical broad-leaved forest zone, with rich species and good ecological protection^[4]. The resort relies on tea fields as vacation scenery and environmental resources to develop rural tourism. The development company has utilized the low price of slope wasteland and integrated unique Hakka culture and the essence of tea culture, to create a three high agricultural ecological park with terraced tea garden ecological landscape as the main body, integrating subtropical orchards, vegetable gardens, gardens, and herbal gardens^[9]. The superior natural environment of Yannanfei Tea Field is integrated with unique Hakka and tea cultures, to achieve two-way interactive development between rural tourism and agriculture. In summary, this paper assumes that there is a deep coupling relationship between rural tourism and rural revitalization in Yannanfei Tea Field Resort.

2 Research method

Coupling analysis is an analytical method that studies the interaction between variables, and the coupling coordination model is used to analyze the level of coordinated development of things. It can help understand the interdependence between different variables and how these relationships to affect the behavior and performance of the entire system. In this paper, by establishing a coordination model between rural revitalization and rural tourism, data are collected and analyzed based on the indicator system, thereby obtaining the performance of the coordination between the two. It aims to provide a basis for optimizing system design and performance, and help better understand and

solve practical problems in the development of rural tourism industry under the background of rural revitalization.

2.1 Comprehensive evaluation index

To obtain the coupling coordination degree of different systems, it is first necessary to calculate the comprehensive evaluation index among the different systems. The comprehensive evaluation index refers to the result of comprehensively evaluating different industries by constructing mathematical models. The specific calculation formula is:

$$U_k = \sum_{j=1}^m \mu_j X_j, i=1, 2, \dots, i; j=1, 2, \dots, j$$

where U_k is the comprehensive evaluation index of the k^{th} system; m is the number of evaluations for the k^{th} system; μ_j is the weight of the j^{th} index of the k^{th} system; X_j is dimensionless value obtained through SPSS standardization.

2.2 Constructing a coupled evaluation index system

The coupling system between tourism development and rural revitalization in Guangdong Yannanfei Tea Field Resort is constantly updating and developing. In this paper, following the principles of feasibility and scientificity, the development status of the resort is comprehensively measured from five levels: demand situation, resource foundation, brand effect, cultural foundation, and time cost. It selects 12 specific indicators: the number of visitors, tourism income, per capita tourism consumption, infrastructure investment funds, natural resource level, agricultural tea field resource level, Yannanfei Tea Field Resort's popularity, popularity of tea product in resort, tea tourism characteristics and experience, Hakka cultural elements and influence, distance from core cities in the Pearl River Delta to resort, and tourist stay time. At the same time, five indexes of prosperous industries, livable ecology, civilized rural culture, effective governance, and affluent life are selected in the rural revitalization, and 17 specific indicators are used to construct rural revitalization evaluation system: the proportion of income from the secondary and tertiary industries to the total income of villagers, the proportion of tea industry employees, the proportion of tourism employees, the green coverage rate of villages, the satisfaction rate of village appearance, transportation convenience, annual concentrated science popularization, average education time of villagers, number of criminal cases, and participation rate of villagers in major matters such as elections, the proportion of "civilized families" and "civilized demonstration households", the visit rate of

cadres linked to farmers, the per capita net income of villagers, the Engel coefficient of households, the per capita housing area, the proportion of households owning private cars, and the proportion of annual education and cultural expenditure to household consumption expenditure^[10]. The combination of the two indicators results in the coupling indicator system of tourism development and rural revitalization in Guangdong Yannanfei Tea Field Resort (Table 1).

Entropy method is used to determine the weights of each indicator^[10]. First, it needs to form the initial matrix:

$$X = (X_{ij})_{mn} (i=1, 2, \dots, n; j=1, 2, \dots, m).$$

where X_{ij} shows the m^{th} index of the i^{th} year. All raw data are standardized using range standardization method, and the formula is as below:

$$X_{ij} = (X_{ij} - X_{j\min}) / (X_{j\max} - X_{j\min})$$

where $X_{j\min}$ and $X_{j\max}$ are the minimum and maximum of the j^{th} index. Specific gravity transformation processing is performed on each indicator, and the formula is as below:

$$S_{ij} = X_{ij} / \sum_{i=1}^n X_{ij}$$

The entropy value of the j^{th} indicator is calculated:

$$h_j = - \frac{1}{\ln n} \sum_{i=1}^n S_{ij} \ln S_{ij}$$

The difference in the j^{th} indicator is calculated:

$$\alpha_j = 1 - h_j$$

The weight of the j^{th} indicator is calculated:

$$\lambda_j = \alpha_j / \sum_{j=1}^m \alpha_j$$

2.3 Constructing a coupling coordination evaluation model

2.3.1 Constructing a coupling degree model. Drawing inspiration from the coupling degree model in the field of physics^[11], the calculation formula for coupling degree of tourism development and rural revitalization subsystems of Guangdong Yannanfei Tea Field Resort is obtained:

$$C = [(U_1 \times U_2) / (U_1 + U_2)^2]^{1/2}$$

where U_1 is comprehensive evaluation value of tourism development in Guangdong Yannanfei Tea Field Resort; U_2 is comprehensive evaluation value of rural revitalization; C is coupling degree, ranging from 0 to 1.

2.3.2 Building a coupled coordination model. Due to the fact that coupling degree can only reflect the coordination status between two or more systems, and cannot reflect whether the interaction between systems promotes or resists each other, it is necessary to further construct

a coupling coordination degree model. The calculation formula is:

$$D = (C \times F)^{1/2}, F = \alpha U_1 + \beta U_2$$

where D is the coupling degree between tourism development and rural revitalization of Guangdong Yunnanfei Tea Field Resort; F is comprehensive evaluation index; α and β are undetermined coefficient, and $\alpha + \beta = 1$. Due to the equal importance of tourism development and rural revitalization in Guangdong Yunnanfei Resort, they need to develop together. Therefore α and β assign an average value of 0.5.

2.4 Evaluation criteria for coupling coordination degree

In order to better distinguish the degree of coordinated development between tourism development and rural revitalization in Guangdong Yunnanfei Tea Field Resort, the “ten-point method” is used to divide the coupling coordination degree into 10 levels (Table 2).

2.5 Analysis of coupling coordination degree results

By calculation, the comprehensive evaluation index and coupling coordination of

tourism development and rural revitalization of Guangdong Yunnanfei Tea Field Resort from 2013 to 2022 are obtained (Table 3).

2.5.1 Comprehensive evaluation and analysis of Guangdong Yunnanfei Tea Field “Tea Travel World” leisure vacation camping site. From Table 3, it can be seen that the comprehensive evaluation value of the tourism development of Guangdong Yunnanfei Tea Field Resort in 2013 was 0.01, which was relatively low. This indicated that the tourism development level of Guangdong Yunnanfei Tea Field Resort in 2013 was relatively low and was in the initial stage. It is necessary to form a good tourism scale and fully utilize tourism resources to promote the development of Yunnanfei Tea Field Resort. From 2013 to 2022, the comprehensive evaluation value of Yunnanfei Tea Field Resort continued to increase. In 2022, the comprehensive evaluation value increased to 1.01, reaching the highest level. This indicated that the development level of Yunnanfei Tea Field Resort in 2022 was the highest. It also reflected the local full development and utilization of

tourism resources, and the demand of tourists for tourism consumption in Yunnanfei Tea Field is increasing.

2.5.2 Analysis of comprehensive evaluation values for rural revitalization. As shown in Table 3, the comprehensive evaluation value of rural revitalization in 2013 was 0.0119, indicating that the implementation of the rural revitalization strategy in the area did not achieve significant success. The comprehensive evaluation value of rural revitalization from 2013 to 2022 has increased from 0.011 9 to 1.010 0, indicating that with the cooperation of the local government and villagers, relevant measures have been taken from the aspects of economy, culture, ecology, etc. to respond to the rural revitalization strategy, and the rural revitalization strategy in the area has achieved significant results.

2.5.3 Analysis of the coupling degree between tourism development and rural revitalization in Guangdong Yunnanfei Tea Field Resort. The overall coupling degree between tourism development and rural revitalization in Guangdong Yunnanfei Tea Field Resort remained stable from 2013 to 2022, with the coupling degree value increasing from 0.498 1 to 0.505 0, with a relatively small increase. At the same time, the coupling coordination degree between the two increased from 0.074 5 to 0.714 1 during this period, indicating that the tourism development of Guangdong Yunnanfei Tea Field Resort has achieved mutual promotion and common development with rural revitalization.

2.6 Analysis of coupling coordination degree

According to the level of coupling coordination degree, the coupling coordination status of tourism development and rural revitalization in Guangdong Yunnanfei Tea Field Resort can be divided into two stages: imbalanced development and coordinated development.

2.6.1 Stage of imbalanced development. It was a

Table 1 The indicator system of the coupling between tourism development and rural revitalization in Guangdong Yunnanfei Tea Field Resort

System layer	Criterion layer	Indicator layer	Weight//%	
Tourism development of Guangdong Yunnanfei Tea Field Resort	Demand condition	Number of receptions//10 ⁴ persons	3.1	
		Tourism revenue//10 ⁴ yuan	13.8	
		Per capita tourism consumption//10 ⁴ yuan	8.2	
	Resource base	Infrastructure investment funds//10 ⁴ yuan	12.1	
		Natural resource level	7.7	
		Agricultural tea field resource level	15.1	
	Brand effect	Popularity of Yunnanfei Tea Field Resort	7.1	
		Popularity of tea product in resort	5.2	
	Cultural foundation	Tea tourism features and experiences//times	9.7	
		Hakka cultural elements and influence	7.8	
	Time cost	Travel time from core cities in the Pearl River Delta to the resort//h	6.4	
		Tourist stay time//h	3.8	
	Rural revitalization	Industrial prosperity	Proportion of income from the secondary and tertiary industries to the total income of villagers	4.4
			Proportion of employees in the tea industry	5.9
Proportion of tourism professionals			3.9	
Ecological livability		Village green coverage rate	8.3	
		Satisfaction with village appearance	8.4	
		Convenience of transportation	9.5	
Rural culture and civilization		Annual centralized science popularization//times	4.5	
		Average education time of villagers//a	3.7	
		Number of criminal cases	7.6	
Effective governance		Participation rate of villagers in major issues such as elections	7.6	
		Proportion of “civilized families” and “civilized demonstration households”	3.2	
		Visiting rate of farmers linked to cadres	6.8	
Live in affluence		Per capita net income of villagers//10 ⁴ yuan	7.5	
		Family Engel's coefficient	4.7	
	Per capita housing area//m ²	7.5		
	Proportion of households owning private cars	3.7		
	Proportion of average annual education and cultural expenditure to household consumption expenditure	2.8		

Table 2 Division of coupling coordination level between tourism development and rural revitalization in Guangdong Yunnanfei Tea Field Resort

Coupling coordination interval	Coordination level
$0 \leq D < 0.1$	Extreme imbalance
$0.1 \leq D < 0.2$	Serious imbalance
$0.2 \leq D < 0.3$	Severe imbalance
$0.3 \leq D < 0.4$	Mild imbalance
$0.4 \leq D < 0.5$	Near imbalance
$0.5 \leq D < 0.6$	Reluctant coordination
$0.6 \leq D < 0.7$	Primary coordination
$0.7 \leq D < 0.8$	Intermediate coordination
$0.8 \leq D < 0.9$	Good coordination
$0.9 \leq D < 1.0$	High-quality coordination

stage of coupling imbalanced development from 2013 to 2018, with coupling coordination degrees of 0.074 5, 0.216 0, 0.279 7, 0.350 6, 0.420 4, and 0.475 4, all below 0.5. The overall situation of coupling coordination was poor. Before 2013, the resources of Yunnanfei tea fields had not yet been developed and utilized, with insufficient investment in related infrastructure construction and insufficient tourism promotion. The economic growth driven by tourism was slow, and the development of the tourism industry was slow. The implementation of the rural revitalization strategy was also in its initial stage and had not yet achieved significant success. A good rural culture and civilization had not been formed in the local area, and the dissemination of characteristic cultures was limited. The tourism resources of Yunnanfei Tea Field are being attempted to integrate with the rural revitalization strategy.

2.6.2 Stage of coordinated development. It was the stage of coupled coordination development during 2019–2022, with coupling coordination degrees of 0.520 8, 0.575 8, 0.648 8, and 0.714 1, all above 0.5. The coordination level was all coordinated, and the overall situation of coupling coordination was good. From 2019 to 2022, effective measures were taken to vigorously develop tea culture and tea tourism, strengthen rural construction, and effectively promote the tourism development in Yunnanfei Tea Field. Tourism development drove the local economy, and it achieved the coordinated development between tourism development and rural revitalization strategy in Yunnanfei Tea Field.

3 Conclusions and suggestions

3.1 Conclusions

By constructing a coupled conceptual model and using the Yunnanfei Tea Field Resort in Meizhou, Guangdong Province as a case study,

empirical analysis is conducted to explore the coupling trend between rural tourism and rural revitalization.

(1) The coordinated development of rural tourism and rural revitalization in Yunnanfei Tea Field Resort is good, and the coupling coordination degree is showing a significant growth trend. In 2022, the coupling coordination degree was 0.714 1, reaching an intermediate level of coordination, but it has not yet reached the stages of good coordination (coordination degree of 0.8–0.9) and high-quality coordination (coordination degree of 0.9–1.0). It indicates that there is still room for improvement in the coordinated development of tourism development and rural revitalization in this resort.

(2) Through diachronic analysis, it is found that the coupling development of rural tourism and rural revitalization in Yunnanfei Tea Field Resort can be mainly divided into two stages: coupling imbalance and coupling coordination. The evolution from the coupling imbalance period to the coupling coordination period indicates that rural tourism in Yunnanfei Tea Field Resort has significantly promoted rural revitalization, and rural revitalization has played a positive role in the development of rural tourism. However, the coordination quality during the coupling coordination period is not high. With the changes in domestic and international economic situations, there are still certain possible threats of coupled floating in the future. The transformation and upgrading of rural tourism and the promotion of rural revitalization strategy in this resort still face some difficulties.

3.2 Suggestions

3.2.1 Fully utilizing the opportunity of rural revitalization strategy, and increasing investment in rural tourism. With the continuous promotion of the rural revitalization strategy, the trend

of coordinated development between rural tourism and rural revitalization in Yunnanfei Tea Field Resort is improving, and it has reached an intermediate level of coordination, indicating that the rural revitalization strategy is a major opportunity for the development of rural tourism. Therefore, Yunnanfei Tea Field Resort should fully utilize this favorable opportunity, increase investment in infrastructure, and promote the upgrading of resort products, to adapt to the people's pursuit of a better life in the new era. At the same time, it should actively strive for strong policies and project funding related to rural revitalization, and use this opportunity to promote the upgrading of products in the resort area.

3.2.2 Promoting the transformation and upgrading of the resort, and enhancing the coupling between rural tourism and rural revitalization. Although the current coupling coordination between tourism development and rural revitalization in Yunnanfei has reached a moderate level of coordination, it has not yet reached a level of good coordination and high-quality coordination. Therefore, based on improving the level of the scenic area, Yunnanfei Tea Field Resort should implement measures for coordinated development with local rural revitalization, deeply integrate into rural development, fully develop the tea fields and tea industry in the resort, carry out tea culture experience and promotion through rural tourism, promote industrialization and branding of tea industry, assist and enrich farmers, and drive the development of rural tea industry through rural tourism.

3.2.3 Promoting the integration of tea and tourism, and developing new business models of tea tourism and rural vacation. The current coupling coordination quality between tourism development and rural revitalization in Yunnanfei Tea Field Resort is not high, and there is still significant room for promotion. In the future, there are still certain potential threats and challenges of coupling and floating. Therefore, Yunnanfei Tea Field Resort needs to seize the current market demand characteristics, promote the integrated development of tea and tourism, and actively carry out new business forms and models of tea and tourism integration. On the one hand, it should promote tourism with tea. The tea fields are beautiful, natural and simple, with a refreshing aroma of tea and a long and fascinating tea culture. These are all advantageous elements of rural vacation, and they need to be deeply integrated into the products and experiences of the resort to improve product

(To be continued in P64)

Table 3 Evaluation of the coupling coordination degree between tourism development and rural revitalization in Guangdong Yunnanfei Tea Field Resort from 2013 to 2022

Year	U_1	U_2	Coupling degree C	Coupling coordination degree D	Coordination level	Coordination status
2013	0.010 0	0.011 9	0.498 1	0.074 5	Extreme imbalance	Imbalanced development stage
2014	0.086 9	0.097 9	0.499 1	0.216 0	Severe imbalance	
2015	0.149 0	0.161 7	0.499 6	0.279 7	Severe imbalance	
2016	0.244 1	0.247 1	0.500 0	0.350 6	Mild imbalance	
2017	0.368 6	0.343 8	0.499 7	0.420 4	Near imbalance	
2018	0.497 7	0.424 0	0.498 4	0.475 4	Near imbalance	Coordinated development stage
2019	0.591 4	0.512 1	0.498 7	0.520 8	Reluctant coordination	
2020	0.747 8	0.612 3	0.497 5	0.575 8	Reluctant coordination	
2021	0.875 3	0.820 4	0.499 7	0.648 8	Primary coordination	
2022	1.010 0	1.010 0	0.505 0	0.714 1	Intermediate coordination	

evaluation results may have some deviation. For the long-term process of rainwater and flood management, a long-term rainfall management monitoring mechanism is adopted to verify the accuracy of the model. On the basis of the preliminary work, this project plans to further carry out research on relevant theories and methods to provide reliable theoretical basis for further improving the accuracy of the model. On this basis, the accuracy of the model will be further improved through interdisciplinary integration.

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quality and level. On the other hand, the current consumption in the cultural and tourism industry market is constantly upgrading, and people are constantly pursuing new consumption trends. Therefore, Yannanfei Tea Field Resort needs to develop distinctive cultural and tourism new formats based on new market demands and its own resource advantages. It could timely develop starry sky accommodation, tent accommodation, and wild luxury vacation format in tea field; carry out customized tea cultivation, harvesting, production, and supply to high-end customers through the form of tea field crowdfunding.

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