

Research on the Integration Degree Evaluation of Rongxian Tea Tourism Industry

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Abstract: This study focuses on the tea tourism industry in Rong County, aiming to provide decision-making basis for industry development through scientific evaluation of its integration degree. Using the industrial comprehensive development level function, synchronicity analysis, and coupling coordination model, select data from 2016 to 2023 for evaluation. The results show that the integration of the tea tourism industry in Rong County is in a moderate coupling and coordination stage, and the overall development level of the tea industry is improving. Although the tourism industry is also showing an upward trend, it is relatively lagging. Based on this, it is proposed to strengthen policy support, improve infrastructure, innovate products and other measures to promote the deep integration and high-quality development of the tea tourism industry in Rong County.

Keywords: Rong County; Tea tourism industry, Integration assessment, Coupling coordination degree model.

1. Introduction

The integration of tea tourism industry, as an emerging model for rural economic development, is of great significance in promoting local economic growth and industrial transformation. As an important tea producing area in Sichuan Province, Rong County has a solid foundation for the integrated development of tea and tourism. Accurately evaluating the integration degree of the tea tourism industry in Rong County, analyzing its current development status and problems, is crucial for promoting sustainable development of the industry. This study uses scientific evaluation methods to deeply explore the integration status of the tea tourism industry in Rong County, in order to provide reference for local governments, enterprises, and others.

2. Purpose and Method of Evaluation

2.1. Purpose of Evaluation

This evaluation aims to accurately assess the degree of integration between the tea industry and tourism industry in Rong County, and clarify the current situation and level of industrial integration. Through quantitative analysis, reveal the synergy, interdependence, and interactive relationship between the tea industry and tourism industry, identify the problems and development potential in the integration process, provide scientific basis for optimizing resource allocation and adjusting development strategies, and promote the sustainable and healthy development of the tea tourism industry.

2.2. Evaluation Methods

(1) Function of comprehensive industrial development level.

The industry and tourism industry are two different subsystems, but they interact with each other. The comprehensive development level of the two can be calculated through linear weighting method. The specific calculation process is shown in equations (1) to (6).

$$Y_{ij} = \frac{x_{ij} - x_{\min}}{x_{\max} - x_{\min}} + 0.01 \quad (1)$$

$$S_{ij} = S_j = \frac{Y_{ij}}{\sum_{i=1}^m Y_{ij}} \quad (2)$$

$$H_j = -\frac{1}{\ln m} \sum_{i=1}^m S_{ij} \ln S_{ij} \quad (3)$$

$$A_j = 1 - H_j \quad (4)$$

$$w_j = \frac{A_j}{\sum_{i=1}^m A_j} \quad (5)$$

$$u_i = \sum_{j=1}^m w_j Y_{ij} \quad (6)$$

In the formula, Y_{ij} represents the i raw data of the j th indicator year, S_{ij} represents the weight of the indicator, H_j is the entropy value, A_j is the coefficient of difference, and w_j is the weight of the indicator. U u_i is the comprehensive development index of the industry, with a value between [0, 1]. The closer the value is to 1, the better the development of the industry; On the contrary, the worse the development situation. In this article, U_1 refers to the comprehensive development level of the tea industry, and U_2 refers to the comprehensive development level of the tourism industry.

(2) Synchronization analysis

To measure the relative development level of two types of industries, that is, the synchronicity between the two, it can be measured by the comprehensive development level of the tea industry and the comprehensive development level of the tourism industry. When $U_1 > U_2$, it represents that the development level of the tea industry is ahead of that of the tourism industry, indicating that the tourism industry is lagging behind; When $U_1 = U_2$, it represents that the two industries are evenly matched, indicating synchronous development; When $U_1 < U_2$, it represents that the development level of the tourism industry is ahead of that of the tea industry, indicating that the tea industry is lagging behind.

(3) Coupling coordination degree model

In physics, fusion is called coupling, which can be applied to two or more industrial systems. The degree of coupling can reflect the degree of mutual influence and interaction between subsystems, but it can lead to the phenomenon of "false coupling coordination". The coupling coordination degree is an indicator used to analyze whether there is a mutually

reinforcing or mutually destructive relationship between systems. Therefore, the coupling coordination degree model can be used to measure the integration degree of the two industries. This article uses the coupling idea to construct a coupling coordination degree model for the tea industry and tourism industry:

$$D = \sqrt{C \times T} \quad (7)$$

$$C = 2 \times \frac{u_1 \cdot u_2}{(u_1 + u_2)^2} \quad (8)$$

$$T = \alpha u_1 + \beta u_2 \quad (9)$$

In the formula, D is a coupled co scheduling, and the closer its value approaches 1, the higher the degree of integration between the tea industry and the tourism industry; C is the coupling degree, with values ranging from [0, 1]. The larger the value, the higher the coupling degree (see Table 1 for specific level classification); T is the comprehensive coordination index, representing the overall benefits of the tea industry and tourism industry; α , β is an undetermined coefficient representing the importance of the tea industry and tourism industry. As the tea industry and tourism industry complement each other and are equally important, this article takes $\alpha=\beta=0.5$.

Table 1. Coordination Degree D-Level Classification Standards

Serial number	Coupling coordination degree D	Coordinate registration	Serial number	Coupling coordination degree D	Coordinate registration
1	(0, 0.1)	Extreme imbalance	6	(0.5001,0.6)	Barely coordinating
2	(0.1001, 0.2)	Serious imbalance	7	(0.6001,0.7)	Primary Coordination
3	(0.2001, 0.3)	Moderate imbalance	8	(0.7001,0.8)	Intermediate coordination
4	(0.3001, 0.4)	Mild imbalance	9	(0.8001,0.9)	Good coordination
5	(0.4001, 0.5)	Frequency imbalance	10	(0.9001,1)	High quality coordination

2.3. Construction of Evaluation Index System and Data Sources

Drawing on the research results related to the evaluation index system of the tea industry and tourism industry, combined with the availability and accessibility of data and the actual situation of Rong County, four indicators of the tea industry system and four indicators of the tourism industry system were constructed with industrial economy and market size as the first level indicator layer. In the tea industry system, the unit price, output, and total value of tea can reflect the market and supply and demand conditions of the tea industry during a certain period; The area of tea that can be harvested can reflect the production scale of the tea industry during a certain period. In the tourism industry system, the total tourism revenue directly reflects the development level of

tourism industry in Rong County. In the process of measuring the level of integrated development of tea tourism in Rong County, this article selected two indicators: the number of hotels and the number of restaurants. The number of scenic spots can also indirectly reflect the current development status of the tourism industry. The more scenic spots there are, the richer the tourism routes available for tourists to choose from. Therefore, this article also includes it as an indicator of the tourism industry. This article selects data from Rong County from 2016 to 2023 as the basis for analyzing the level of integration in the tea tourism industry. The data involved in the study comes from the "Zigong Statistical Yearbook", "Rong County Statistical Yearbook", corresponding statistical yearbooks and bulletins of the Sichuan Provincial Department of Agriculture and Rural Affairs and Zigong City, as well as data published by relevant departments such as tourism and culture (see Table 2).

Table 2. Tea Planting in Rong County from 2016 to 2023

particular year	2016	2017	2018	2019	2020	2021	2022	2023
Area/acre	94237	100535	104245	125010	128798	131054	133228	134553
Production/ton	11279	11344	12188	14002	14419	15486	16411	17900
Output value/100 million	17.894	19.657	31.998	38.969	80.299	62.963	68.106	91.29

Table 3. Evaluation Results of Integrated Development of Tea Industry and Tourism Industry in Rong County from 2016 to 2024

particular year	U1 Comprehensive Development Level of Tea Industry	U2 Comprehensive Development Level of Tourism Industry	U comprehensive development level	C coupling degree	D Coordinated Scheduling	Coordination level
2016	0.2304	0.1945	0.2125	0.4179	0.2871	Mild imbalance
2017	0.2531	0.2392	0.2462	0.4210	0.3243	Mild imbalance
2018	0.3098	0.2786	0.2942	0.4457	0.3594	On the brink of imbalance
2019	0.3654	0.3519	0.3587	0.4912	0.4193	Barely coordinating
2020	0.2987	0.1864	0.2426	0.4125	0.3168	Mild imbalance
2021	0.4105	0.3721	0.3913	0.5298	0.4509	Preliminary coordination
2022	0.4582	0.4097	0.4340	0.5621	0.4932	Moderate coordination
2023	0.5016	0.4562	0.4789	0.5933	0.5280	Moderate coordination

3. Measurement of the Integration Level of Tea Tourism Industry

After calculating the comprehensive development index of the tea industry and tourism industry in Rong County, the coupling coordination degree model was used to quantitatively calculate the coupling degree C and coordination degree D of the two subsystems from 2016 to 2023, and the comprehensive evaluation index for each year was obtained (see Table 3).

4. Analysis of the Evaluation Results of The Integration Level of The Tea Tourism Industry

4.1. Analysis of the Comprehensive Development Index of the Tea Industry and Tourism Industry in Rong County

The comprehensive development level of the tea industry has shown an overall upward trend from 2016 to 2023. In 2016, it was 0.2304 and has been increasing year by year since then. Although there was a certain degree of decline in 2020, it continued to rise and reached 0.5016 by 2023. The growth rate was relatively slow from 2016 to 2018, with a significant increase from 2018 to 2019. In 2020, there was a decline due to special circumstances, and the growth rate remained relatively stable from 2021 to 2023. The comprehensive development level of the tourism industry is also showing an overall upward trend. In 2016, it was 0.1945, which also fluctuated and increased during the period. In 2020, the decline was more significant, and then it resumed growth, reaching 0.4562 in 2023. The growth from 2016 to 2019 was relatively stable, but in 2020 it decreased significantly due to external factors. From 2021 to 2023, growth will resume, and there are signs of accelerating growth trend. During the period of 2016-2019, the comprehensive development level of the tea industry has consistently been higher than that of the tourism industry. In 2020, both were impacted to some extent, with the tourism industry being more affected, and the gap between the comprehensive development level of the tea industry and the tourism industry widening. From 2021 to 2023, the comprehensive development level of the tea industry is still higher than that of the tourism industry, but the growth rate of the tourism industry tends to catch up with the tea industry

4.2. Analysis of the Evolution of Coupling Coordination between the Tea Industry and Tourism Industry in Rong County

The coupling degree shows an overall upward trend from 2016 to 2023. The coupling degree was 0.4179 in 2016 and will increase to 0.5933 by 2023. This indicates that the interaction and correlation between the comprehensive development level of the tea industry and the comprehensive development level of the tourism industry are constantly increasing. As time goes by, the connection between the two industries becomes increasingly close, and their development has a greater impact on each other. From 2016 to 2018, the growth of coupling degree was relatively flat, increasing from 0.4179 to 0.4457. During this period, the correlation between the two industries gradually strengthened, but the speed was relatively slow. In 2018-2019, there was a significant increase in coupling degree, from 0.4457 to 0.4912, which may be due

to the emergence of some favorable factors in policies, markets, and other aspects that promote coordinated development between the two industries, leading to a closer connection between them. In 2019-2020, the coupling degree decreased from 0.4912 to 0.4125, possibly due to external environmental changes in 2020 (such as the impact of special events) that impacted the development of the two industries and hindered their collaborative cooperation, resulting in a decrease in coupling degree. From 2020 to 2023, the coupling degree continued to rise, with a significant increase from 0.4125 to 0.5933, indicating that after experiencing fluctuations in 2020, the two industries gradually recovered and strengthened their connections with each other, and the trend of industrial synergy development became increasingly evident.

The coordination degree also shows an upward trend, rising from 0.2871 in 2016 to 0.528 in 2023. This indicates that the coordination and cooperation between the tea industry and the tourism industry are constantly improving in the process of development, and the development of the two industries is gradually shifting from less coordinated to more coordinated. In 2016-2017, the coordination level was mildly imbalanced, indicating that there was a certain degree of inconsistency in the development between the two industries in these two years, which may have problems in resource allocation, market demand matching, and other aspects. In 2018, the coordination level was on the verge of imbalance. Although it was still in a somewhat uncoordinated state, there was some improvement compared to the previous two years, and the coordination value has increased. In 2019, the coordination level reached barely coordinated, indicating significant progress in the coordination and cooperation between the two industries, and the development of the industries began to trend towards mutual promotion. In 2020, the coordination level returned to mild imbalance, which corresponds to the decline in coupling in 2020, indicating that external factors have had a significant negative impact on the coordinated development of the two industries. In 2021, the coordination level is preliminary coordination, and the coordination and cooperation between industries have further improved. The two industries are now able to better adapt to each other and promote development. From 2022 to 2023, the coordination level is moderate coordination, indicating that the coordination and cooperation between the two industries have reached a high level, and the effect of industrial synergy development is gradually emerging. Good results may have been achieved in resource sharing, market expansion, and other aspects

4.3. Summary of Integration Evaluation of Rongxian Tea Tourism Industry

According to the coupling coordination degree value, the coupling degree between the tea industry and tourism industry in Rong County is 0.5933, and the coordination degree is 0.528. The integration of the tea tourism industry in Rong County is in a moderate coupling coordination stage. Although certain connections and synergies have been established, there is still a gap in the level of high-quality coordination, and it is in a critical period of development from initial integration to deep integration. Rongxian's tea industry has a solid foundation, with continuous growth in tea garden area, output, and value, providing abundant resources and raw materials for tea tourism integration. The accumulated brand foundation also helps to enhance the brand influence of tea

tourism integration. The tourism industry in Rong County lags in the integration of tea and tourism, with a lower comprehensive development level than the tea industry. Indicators such as tourism revenue and tourist numbers fluctuate greatly, and the ability to resist risks is weak. The level of tourism infrastructure and services needs to be improved, with accommodation facilities mainly consisting of rural homestays and insufficient professional guidance services. In terms of market promotion, relying on traditional methods, insufficient utilization of new media, incomplete establishment of brand image, and limited market influence. The integration of resources is not sufficient, and the tea gardens and tourism resources have not been effectively integrated. Many tea gardens only carry out simple sightseeing and tea picking activities, without forming linkage with other local cultural tourism resources, and cannot provide comprehensive and diversified tourism products, which reduces the stay time and consumption potential of tourists.

5. Conclusion and Suggestions

The integrated development of the tea tourism industry in Rong County has achieved certain results, but still faces many challenges. To promote deep integration and high-quality development of industries, it is recommended to take the following measures: strengthen policy support and guidance, enhance policy publicity and implementation, and establish special funds to support tea tourism integration projects; Improve infrastructure construction, enhance transportation convenience and scenic area supporting facilities, and improve tea garden sightseeing facilities and services; Enhance the innovation and diversification of tea tourism integration products, develop characteristic tea tourism experience projects, and launch characteristic tourism projects in conjunction with rural revitalization; Developing smart tourism, introducing smart tourism systems, and utilizing modern technology to enrich tourism content; Intensify market promotion efforts, enhance brand influence, and shape a unified tea tourism brand image through a combination of online and offline promotion; Establish a multi-party benefit sharing mechanism, promote win-win cooperation between tea farmers and tourism enterprises, and encourage social capital participation; Enhance the quality and skills of practitioners, conduct targeted training, and establish talent introduction and incentive mechanisms. These measures will help to enhance the depth and breadth of the integration of tea and tourism in Rong County, achieve high-quality integrated development of the tea industry and tourism industry, and inject new vitality into the local economy and social development. To achieve high-quality coordinated development of the tea industry and tourism industry, drive local economic growth, and assist in the comprehensive implementation of the rural revitalization strategy.

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