

Selection of Livelihood Strategies for Farmers in Tourist Destinations in the Context of Rural Informatization: A Case Study of Xijiang Miao Village

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Abstract In the information age, the movement of livelihood factors between urban and rural areas, particularly involving farmers in rural tourism destinations, has stimulated the spatial revitalization and functional renewal of these destinations, thereby facilitating the advancement of rural revitalization. The examination of livelihood strategy selection among farmers in rural tourist destinations during the information age is a critical scientific inquiry for the sustainable development of rural tourism. This research holds substantial significance for enhancing the livelihood capabilities of farmers and contributing to the revitalization of rural industries. This study utilizes Xijiang Miao Village as a case study to conduct an in-depth analysis of farmers' livelihood strategy selection through the application of the entropy evaluation method and the binary logistic regression model. The findings indicate that the robust development of rural tourism has led to significant alterations in the original composition of livelihood capital in tourist destinations. Currently, four distinct types of livelihoods have been identified: agricultural-based, migrantwork-oriented, tourism-specialized, and tourism-supplemented. Due to the uneven distribution of livelihood capital, the predominant livelihood modes for farmers in rural tourism destinations remain the agricultural-based and tourism-supplemented types. Human capital and economic capital are the primary factors influencing the strategic choices made by farmers. In this context, a livelihood selection strategy for farmers in rural tourist destinations, specifically in Xijiang Miao Village, is proposed, taking into account the background of rural informatization.

Keywords Rural informatization, Tourist destination, Farmers' livelihood

DOI 10.16785/j.issn 1943-989x.2025.2.009

The widespread implementation of information technology has significantly contributed to the advancement of the rural tourism economy. On one hand, the comprehensive promotion of rural informatization presents a novel opportunity for the informatization construction of rural tourism^[1]. On the other hand, the production and organizational components of rural tourist destinations are being restructured in the new flow relationship^[2], resulting in dynamic changes in the livelihood spaces of farmers in these areas. Since the implementation of the rural revitalization strategy, rural tourism destinations have assumed a significant role in facilitating the transformation and revitalization of rural economic development, thereby contributing to the enhancement of living standards for farmers in these areas. However, during the course of tourism development, the influences of globalization and informationization have led to a diversification in the livelihood strategies adopted by farmers.

Rural tourism emerged in Europe during the middle 19th century as a novel industry that integrates information technology, contemporary tourism, and traditional agriculture. This sector represents a contemporary approach for individuals seeking to reconnect with nature while

simultaneously fostering rural economic development^[3]. The livelihood challenges faced by farmers in this domain have emerged as a significant area of research, yielding a wealth of findings^[4-7]. These findings offer both theoretical methods and practical guidance for conducting comprehensive investigations into the livelihood issues of farmers. Furthermore, they facilitate the innovative advancement of geographic concerns related to farmers in tourist destinations. The ongoing advancement of tourism has increasingly highlighted social issues stemming from the unequal distribution of resources, which is largely attributable to disparities in livelihood capital. Despite this, there remains a paucity of research reports addressing the selection of livelihood strategies among farmers in rural tourism destinations within ethnic regions. Furthermore, there is a pressing need for the expansion and enrichment of quantitative research in this area. The integration of rural informatization construction with the livelihood development of farmers in tourist destinations is advantageous for achieving a systematic connection between industrial development and rural tourism. Furthermore, this integration is a critical area for future research concerning the livelihoods of farmers in rural tourist

destinations, holding significant importance for enhancing the competitiveness of the rural tourism industry.

In light of the aforementioned considerations and against the background of rural informatization development, this study focuses on Xijiang Miao Village as the research area. Utilizing the sustainable framework established by the Department for International Development (DFID)^[8], a livelihood capital evaluation system for farmers in rural tourist destinations has been developed. Furthermore, a logistics binary regression model, in conjunction with the entropy evaluation method, is employed to analyze the challenges encountered by farmers in rural tourist destinations regarding their selection of livelihood strategies, as well as the primary influencing factors associated with these choices. Through this analysis, a series of practical recommendations have been formulated to optimize the selection of livelihood strategies for farmers in rural tourism destinations. These recommendations aim to serve as a valuable reference for the sustainable development of this sector.

1 Overview of the study area

Xijiang Miao Village is situated in the southeastern region of Kaili City, approximately

Received: February 21, 2025 Accepted: March 25, 2025

Sponsored by Science and Technology Project of Qiandongnan Prefecture "The Integration Effect of Green 'Culture-Tourism' Industry in Qiandongnan Prefecture and Its Enhancement Mechanism" (202305); Science and Technology Project of Qiandongnan Prefecture "Construction and Empirical Study of an Integration Model for Tourism and Culture Industry in Qiandongnan from the Perspective of Quality Development" (2022084).

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280 km from Guiyang City, and 36 km from Kaili City. The village is located at the foothills of Leigong Mountain, in proximity to the Leigong Mountain National Nature Reserve. This area falls within the subtropical monsoon climate zone, characterized by an average annual temperature of 15 °C, substantial precipitation, high forest coverage, and a diverse array of vegetation types. Xijiang Miao Village comprises five natural villages, including Yangpai, Pingzhai, Nanguai, and Dongyin. It is home to a total of 1,432 households and over 5,000 residents. The village is recognized as the first of the four traditional villages in Qiandongnan Prefecture, often referred to as the Miao Capital. It serves as a focal point for Miao culture, customs, and traditions, thereby fostering unique opportunities for tourism.

In the context of rural informatization, Xijiang Miao Village has emerged as a frontrunner in the advancement of rural tourism, owing to its distinctive resources. Over the past decade, the tourism revenue of Xijiang Miao Village has escalated from less than 100 million yuan to 4.9 billion yuan, reflecting a remarkable 49-fold increase in overall income. As of August 2019, Xijiang Miao Village welcomed a total of 7,126,800 visitors, generating a tourism revenue of 6.058 billion yuan. The village is home to approximately 1,000 tourism-related enterprises, which have facilitated the employment of over 2,000 local farmers. The economic benefits derived from tourism development are significant, resulting in tangible advantages for farmers. The rapid advancement of rural informatization has led to a pronounced issue of over-commercialization in tourism. This phenomenon has resulted in conflicts regarding the distribution of benefits between enterprises and local farmers, thereby adversely impacting the sustainable development of the Xijiang Miao Village tourist destination.

In recent years, Leishan County has effectively utilized the power of science and technology to develop various intelligent systems, thereby establishing a robust informatization security network in Xijiang Miao Village. Firstly, the county has focused on the development and implementation of intelligent information systems aimed at modernizing tourism management within the Miao village. Secondly, it has leveraged the enhancements made to the SkyNet project system to modernize agricultural production and management practices among local farmers. This initiative provides a comprehensive informatization platform that

supports the livelihoods of farmers in the tourism destination of Xijiang Miao Village and contributes to the revitalization of rural tourism.

2 Methods and data

2.1 Construction of evaluation indicator system

In the information age, the farmers' livelihood strategies in rural tourism destinations are predominantly characterized by various indicators, including human capital, natural capital, social capital, economic capital, institutional capital, and other dimensions. The binary regression model serves as a scientific evaluation framework for conducting research on the selection of livelihood strategies employed by farmers in these rural tourism contexts^[7]. The Internet, typified by information and communication technology, has introduced innovative production tools to emerging farmers, thereby enhancing their autonomy in spatial decision-making. Firstly, the distinctive agricultural products and handicrafts produced in rural areas, along with abundant tourism information, can be directly showcased to consumers nationwide and even globally, facilitated by platforms established through the Internet. Secondly, the Internet has transformed the historical context in which labor and leisure were entirely segregated in both temporal and spatial dimensions. This transformation has led to an evolution in labor patterns, moving towards decentralization and diversification^[9]. In accordance with the DFID analysis framework^[10] and informed by the existing research literature^[11], a measurement system was developed to assess the farmers' livelihood strategies in tourist destinations. This system was constructed from five primary dimensions of livelihood capital: natural capital, physical capital, financial capital, human capital, and social capital, tailored to the specific conditions of the study area.

2.2 Data sources and research methods

The data sources utilized in this study were comprised of two components. The first component involved a questionnaire survey conducted in Xijiang Miao Village, which serves as the study area. The survey incorporated the aforementioned indicators of farmers' livelihood capital (Table 1) and achieved a validity rate of over 90% for the collected questionnaires. The second component was sourced from the *Statistical Yearbook of Qiandongnan*, compiled by the Qiandongnan Prefecture Statistical Bureau, as well as from the official website of the Culture, Sports, Radio, Television, and

Tourism Bureau of Qiandongnan Prefecture. Based on the nature of the labor performed by the workforce, the primary source of household income, and an analysis of survey data pertaining to farmers in rural tourism destinations, the livelihoods were categorized into four distinct types: agricultural-based, migrantwork-oriented, tourism-specialized, and tourism-supplemented (Table 1).

2.2.1 Composition and measurement of farmers' livelihood capital. Utilizing the sustainability analysis framework diagram proposed by DFID^[8], a quantitative analysis of the livelihood situation in Xijiang Miao Village was conducted through the establishment of evaluation indicators. Additionally, a livelihood capital composition system for the selection of livelihood strategies of farmers was developed (Table 2). The standard deviation standardization method was employed to normalize the raw data of the measured indicators, while the entropy evaluation method was utilized to ascertain the weights of these indicators^[12].

The assessment of the values of various livelihood capitals, as well as their total values, must be grounded in the weights and standardized values assigned to each indicator. The average value of distinct livelihood capitals is associated with the indicators and total values of the livelihood capitals of different farmers. Assuming that the total value of livelihood capitals is denoted as F , the following formula can be derived:

$$F = \sum_{i=1}^I \sum_{j=1}^J \delta_{ij} \times Z_{ij} \quad (1)$$

where δ_{ij} represents the weight assigned to the j -th evaluation indicator corresponding to the i -th type of livelihood capital, while Z_{ij} denotes the standardized value of the j -th evaluation indicator for the i -th type of livelihood capital.

2.2.2 Binary Logistic regression analysis model. The SPSS software was employed to develop a binary logistic regression model for the factors influencing the selection of livelihood strategies. Utilizing the method of maximum likelihood estimation, the dependent variable was defined as the farmers' selection of livelihood strategies, while various livelihood indicators served as independent variables. In this context, X represents the response variable, and P denotes the probability associated with the model's response. The probability of non-response is expressed as $(1-p)$. Subsequently, P is transformed into a logistic function, and the regression model is constructed as follows:

$$\text{logistic}(P) = \ln \frac{P}{1-P} = \alpha + \sum_{i=1}^n \beta_i X_i \quad (2)$$

$$P = \frac{\exp(\alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k)}{1 + \exp(\alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k)} \quad (3)$$

where P represents the motivation of farmers to engage in tourism activities. The intercept is denoted as α , while the independent variables are represented as X_1, X_2, \dots, X_k . The regression undetermined coefficients are indicated by $\beta_1, \beta_2, \dots, \beta_k$, reflecting the extent of the influence of the independent variables X on the logistic (P).

3 Results and analysis

3.1 Analysis of farmers with different livelihood strategies and their basic characteristics in Xijiang Miao Village

In the context of rural informatization, due to the differences in livelihood capital, farmers will choose appropriate livelihood strategies based on the possession of livelihood capital^[13]. Survey data indicate that the livelihood types of farmers in Xijiang Miao Village predominantly fall into four categories: agriculture-based, migrant

work-oriented, tourism-specialized, and tourism-supplemented (Table 3).

The predominant livelihood type among farmers in the study area was the tourism-supplemented category, which constituted 39.43% of the total sample. Farmers within this category utilized modern information technology more frequently to enhance their livelihoods. They possessed a greater number of household durable goods, averaging 15.21 items, and reported a higher annual income, with an average of 101,600 yuan. Additionally, this group had a larger household size, averaging 4.48 individuals. However, they had the least amount of cultivated and forest land compared to other livelihood types. Furthermore, they benefited from a diverse range of income sources, with their income ranking second only to that of the tourism-specialized category among the four identified livelihood types. The tourism-specialized category constituted 25.71% of the total sample. Farmers within this category

exhibited the highest frequency of utilizing modern information technology to support their livelihoods. They possessed the greatest number of household durables, averaging 15.72 items, and reported the highest income, with an average of 113,800 yuan. Additionally, they cultivated the smallest area of land, averaging 913.79 m². The primary source of income for these farmers was derived from tourism activities, which contributed to an improved standard of living. Agriculture-based farmers constituted 19.43% of the total sample. This category of farmers utilized modern information technology to support their livelihoods less frequently compared to other groups. They typically had smaller household sizes, averaging 3.64 individuals, and possessed the largest area of cultivated land, with an average of 2,147.74 m². Their income was predominantly derived from farming activities, and their annual income was the lowest among the four livelihood types, resulting in a comparatively lower standard of living. Migrant work-oriented

Table 1 Types and division of farmers' livelihood in Xijiang Miao Village

| Type of farmers | Main source of income | Type of labor | Sample size | Proportion//% |
|----------------------|--|---|-------------|---------------|
| Agriculture-based | Agriculture income $\geq 60\%$ | Agricultural planting and breeding | 34 | 19.43 |
| Migrantwork-oriented | Labor income $\geq 60\%$ | Non-agricultural and non-public service employment activities | 27 | 15.43 |
| Tourism-specialized | Tourism-specialized income $\geq 60\%$ | All types of tourism business activities | 45 | 25.71 |
| Tourism-supplemented | Comprehensive income $\geq 60\%$ | Balanced participation in activities such as employment and tourism | 69 | 39.43 |

Table 2 Livelihood capital composition system of farmers in Xijiang Miao Village

| Primary indicator | Secondary indicator | Symbol | Weight | Description of indicator |
|--------------------------|--|--------|--------|--|
| Human capital (R) | Number of household laborers | R_1 | 0.354 | Non-labor force=0, semi-ablebodied worker=0.5, able-bodied worker=1 |
| | Educational level of household members | R_2 | 0.356 | Illiteracy=0, primary school=0.25, middle school=0.5, high school=0.75, junior college and above=1 |
| Natural capital (Z) | Household size | R_3 | 0.296 | Average household size |
| | Cultivated land area | Z_1 | 0.329 | Average cultivated area per household |
| | Forest land area | Z_2 | 0.675 | Average forest land area per household |
| Social capital (S) | Urgent capital costs | S_1 | 0.108 | Costs of major illnesses and other types of capital costs |
| | Interpersonal expenses | S_2 | 0.488 | Gifts for banquets, New Year's red packets, etc. |
| Economic capital (J) | Household income | J_1 | 0.455 | Household cash income |
| | Lending opportunities | J_2 | 0.061 | Including bank lending and lending from friends, the ability to obtain one is equal to 0.5 and two or more is equal to 1 |
| Physical capital (W) | House area | W_1 | 0.353 | House area 0–100 m ² =0.2, 100–200 m ² =0.4, 200–400 m ² =0.6, 400–600 m ² =0.8, above 600 m ² =1 |
| | House type | W_2 | 0.368 | Earth-timber structure=0.25, brick-timber structure=0.5, brick-concrete composite structure=0.75, reinforced concrete structure=1 |

Table 3 Basic characteristics of farmers with different livelihood strategies

| Type of farmer | Agriculture-based | Migrant work-oriented | Tourism-specialized | Tourism-supplemented |
|--|-------------------|-----------------------|---------------------|----------------------|
| Percentage of farmers in each type//% | 19.43 | 15.43 | 25.71 | 39.43 |
| Household size//person | 3.64 | 4.24 | 4.36 | 4.48 |
| Cultivated land area//m ² | 2,147.74 | 2,121.06 | 913.79 | 840.42 |
| Forest land area//m ² | 1,760.88 | 333.50 | 166.75 | 260.13 |
| Number of durable goods//item | 4.18 | 6.21 | 15.72 | 15.21 |
| Annual income//10 ⁴ yuan | 1.98 | 4.25 | 11.38 | 10.16 |
| Agriculture income//10 ⁴ yuan | 1.44 | 0.38 | 0.42 | 0.91 |
| Labor income//10 ⁴ yuan | 0.44 | 3.63 | 0.32 | 2.40 |
| Tourist income//10 ⁴ yuan | 0 | 0 | 10.00 | 4.32 |
| Other income//10 ⁴ yuan | 0.10 | 0.24 | 0.44 | 2.52 |

category constituted 15.43% of the total sample. The frequency with which these farmers utilized modern information technology to support their livelihoods was situated in the mid-range. Their primary source of income was derived from labor, and they possessed fewer durable goods, averaging 6.21 items, which was only higher than that of the agriculture-based farmers. The average household size was 4.24 individuals, and their income was comparatively lower, averaging 42,500 yuan; however, this represented a better standard of living than that of the agriculture-based farmers. At present, the swift advancement of rural informatization has led to the maturation of the rural tourism development model in Xijiang Miao Village. Farmers are now able to utilize the rural informatization service platform effectively, which has proven to be instrumental in generating foreign exchange through tourism. Furthermore, the rural informatization platform functions as a primary auxiliary tool for their operational activities.

3.2 Analysis of the influence of farmers' livelihood capital on the selection of livelihood strategies in Xijiang Miao Village

By integrating the questionnaire data with statistical data, this study posited that the secondary indicators of livelihood capital were pivotal factors influencing farmers' livelihood selection. To validate this hypothesis, a binary logistic regression model was employed using SPSS software. The likelihood estimation yielded a value of 230.257, and the R^2 was calculated to be 0.39, both of which aligned with the model's expectations. Consequently, the model demonstrated a good fit, and the assumptions underpinning the analysis were deemed valid. The results of the binary regression analysis are presented in Table 4. According to the current state of industrial evolution in Xijiang Miao Village, it is evident that the industry in the tourism destination has completed the transfer from primary industry to tertiary industry. The

development model for rural tourism has been progressively maturing, and tourism activities have become a significant means of increasing income for the majority of farmers in the area. However, the primary challenge faced by most farmers is how to enhance their livelihood capabilities through the selection of appropriate livelihood strategies. Consequently, the critical factor in determining the livelihood activity strategies of farmers in tourism destinations is the influence of various factors on the extent of their livelihood capital, which subsequently guides farmers in making informed choices. Notably, human capital and economic capital are significant determinants that encourage farmers to engage in strategic selection.

The analysis revealed that in the Xijiang Miao Village tourism region, the distribution of the five major livelihood capitals among farmers was uneven, resulting in significant instability in their livelihoods. Specifically, human capital, natural capital, physical capital, and financial capital were critical factors influencing farmers' selection among agriculture-based, migrant work-oriented, tourism-specialized, and tourism-supplemented livelihoods. In light of the rapid advancement of rural informatization in recent years, the disparities in human capital across the different livelihood strategies adopted by farmers have diminished significantly. The predominant reason for this phenomenon is that a significant majority of farmers possess optimism regarding the advancement of the rural tourism industry. They have benefited from the economic gains associated with tourism development, which has enhanced their household livelihood capital and bolstered individual motivation to participate in tourism-related activities. Consequently, an increasing number of farmers have opted for a tourism-specialized livelihood strategy, thereby diminishing their reliance on the other three livelihood options. This shift has contributed to the establishment of a virtuous cycle within the developmental framework of

rural informatization and the tourism industry. Therefore, it is imperative to recognize the influence of livelihood capital on farmers' selection regarding their livelihood strategies.

4 Conclusions and recommendations

4.1 Conclusions

In the context of rural informatization, this study focuses on Xijiang Miao Village as the research area. The entropy evaluation method and binary logistic regression model are employed to analyze the selection of livelihood strategies among farmers in this tourist destination. The findings indicate that the development of rural tourism has altered the original composition of livelihood capital within the tourism destination, resulting in the emergence of four distinct livelihood types: agriculture-based, migrant work-oriented, tourism-specialized, and tourism-supplemented. Furthermore, the distribution of livelihood capital is characterized by significant unevenness, with the predominant livelihood strategies among rural tourism farmers remaining largely focused on migrant work-oriented and tourism-supplemented types. Additionally, human capital and economic capital are identified as the primary factors influencing farmers' strategic selection. The advancement of rural informatization plays a supportive role in facilitating the selection of livelihood strategies by farmers.

4.2 Recommendations

In light of the aforementioned conclusions and within the framework of rural informatization, the following recommendations are proposed.

(1) It is essential to enhance investment in information education and employment skills training to elevate the livelihood skills of farmers. This approach aims to improve their conceptual awareness, foster the development of the specialty tourism industry, and encourage farmers to consider rural tourism as a viable

Table 4 Binary logistic regression analysis

| Primary indicator | Secondary indicator | Regression coefficient | Significance |
|-------------------|--|------------------------|--------------|
| Human capital | Number of household laborers | 8.416 | 0.004 |
| | Educational level of household members | 7.862 | 0.008 |
| | Household size | 0.468 | 0.865 |
| Natural capital | Cultivated land area | -8.176 | 0.002 |
| | Forest land area | 0.076 | 0.856 |
| Social capital | Urgent capital costs | 7.142 | 0.006 |
| | Interpersonal expenses | 7.643 | 0.008 |
| Economic capital | Household income | 5.701 | 0.015 |
| | Lending opportunities | 5.001 | 0.025 |
| Physical capital | House size | 8.639 | 0.003 |
| | House type | 2.257 | 0.125 |

livelihood strategy by augmenting their own capacity for sustainable livelihoods. In light of the livelihood capital circumstances of the farmers in Xijiang Miao Village, it is essential to identify and prioritize the specific forms of capital that require enhancement. This strategic improvement aims to eliminate barriers to farmers' participation, thereby empowering them as key stakeholders in the integrated development of rural informatization and tourism.

(2) It is essential to integrate rural informatization with the tourism industry. This can be achieved by implementing incentive policies, broadening access to lending opportunities, establishing dedicated funds to improve the informatization of farmers' tourism activities, and offering subsidies to support farmers in launching rural tourism initiatives. However, farmers in Xijiang Miao Village often exhibit a passive response to the local rural tourism development policies. The provision of start-up lending funds aims to mitigate the operational risks faced by farmers, thereby facilitating the deeper integration of rural informatization and the tourism industry.

(3) Establishing a fair market environment is crucial for promoting the sustainable development of rural tourism destinations. In the context of the information age, the livelihood selection strategies employed by farmers in rural tourism destination present new demands for the advancement of the tourism industry. It is essential to consistently optimize resource allocation within rural tourism destinations and to improve the livelihood development of farmers in these regions. On one hand, they encourage farmers in Xijiang Miao Village to

collaborate in pursuit of common development and warmly welcome tourists. On the other hand, the overall order of development is maintained through the standardized management practices implemented by supervisors, thereby fostering innovative growth within the tourism industry of Xijiang Miao Village.

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