Evaluation of rural ecotourism resources based on the AHP Method in Shanghai

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Abstract. In order to develop rural eco-tourism better, it is very important to establish a suitable evaluation index system of tourism resources. This study constructs an evaluation indicator system of rural ecotourism resources in Shanghai from three aspects: Resource values, ecological environment and development conditions, which includes 18 indexes. Using AHP to determine the weight, in the comprehensive level of evaluation, Resource values (B1) > Ecological environment (B2) > Development conditions (B3). Among the most important indicators are: Recreational value (C1), Pollution control capability (C8), Farming experience value (C7), Environmental hygiene (C9), Convenience of transportation (C14), Ecological value (C4) and Life experience value (C6). By using this evaluation model to grade the rural ecotourism resources in Shanghai through questionnaire survey, the result is that the rural ecotourism resources in Shanghai are quite good. With the development of the construction of the Beautiful Country, the value of rural eco-tourism resources in Shanghai has been continuously explored and the eco-environmental quality is assessed higher, which provides an important guarantee for the development of rural eco-tourism in Shanghai. In addition, cultural values and health value need to be tapped in depth, and efforts should be made to increase the publicity and communication among local residents in rural tourist destinations. While optimizing the construction of tourism facilities, we must constantly improve the level of service management, so as to improve the service quality of rural ecotourism.

1. Introduction

Agriculture is an important part and green contributor of ecological civilization construction and rural eco-tourism has become a new engine of rural economic development. In particular, the outbreak of the new epidemic in 2020 makes the whole setup of world tourism change dramatically. Under the situation of normalization of epidemic prevention, local tour has become the mainstream of tourism in China, and rural tour has become one of the main types of tourism chosen by Chinese people. By giving full play to the ecological advantages of rural areas and leading the industrial development with ecology, rural tourism lays out the eco-tourism product system. Due to the different resource base, the direction of development and protection of rural eco-tourism resources is also different. This study focuses on the construction of evaluation model of rural eco-tourism resources, and puts forward suggestions for better development and utilization of rural tourism resources.

2. Overview of the study area

Shanghai, located at the estuary of the Yangtze River, is a leading city in the Yangtze River economic belt. It faces Japan's Kyushu Island across the East China Sea, Hangzhou Bay in the south, and Jiangsu
and Zhejiang provinces in the north and West. Shanghai has 16 municipal districts with a total area of 6340 square kilometres. It has a subtropical humid monsoon climate of four distinct seasons, sufficient sunshine and abundant rainfall. Shanghai is an important economic, transportation, science and technology, industry, finance, exhibition and shipping centre in China, and one of the largest metropolitan areas in the world. At the same time, Shanghai is also a good international port. The Yangtze River Delta urban agglomeration, which is composed of Shanghai, Jiangsu, Zhejiang and Anhui, has become one of the six world-class urban agglomerations of the world. Shanghai is also a national historical and cultural city, with many historical sites. As a super metropolis, rural areas are the scarce resources of Shanghai. The rural construction led by ecology and green will become the highlight of Shanghai and the background of beautiful Shanghai.

Leisure agriculture and rural tourism in Shanghai began in the early 1990s. During the 13th Five Year Plan period, 37 Rural Revitalization demonstration villages, 17 key Rural Tourism Villages and 124 municipal beautiful rural demonstration villages have been constructed in Shanghai, 315 leisure agriculture and rural tourism spots have been constructed. A total of 21 villages have won the title of China's beautiful leisure village, 17 villages have been included in the national list of key rural tourism villages, 13 villages and towns have been selected as the famous historical and cultural towns and villages in China, The rural tourism industry receives 18 million visitors annually. In recent years, with the comprehensive implementation of the Rural Revitalization Strategy, the construction of beautiful villages in nine agricultural areas of Shanghai has achieved fruitful results, which has laid the foundation for the great development of rural tourism in Shanghai. At present, Shanghai rural tourism has gradually formed a pattern of "spot— route— area" from spot to route and from route to area. The rural eco-tourism resources in Shanghai are rich and diverse, including forest park, conservation forest, breeding base, country park, wetland park, eco-village, eco-park.

3. Research Method

Analytic Hierarchy Process (AHP) is a better method to determine the weight. It is a multi-objective and multi-criteria decision-making method that divides the factors in a complex problem into interrelated and ordered levels; it is an effective method combining quantitative analysis with qualitative analysis [1]. In this paper, the researcher constructs the model in strict accordance with the procedure prescribed by AHP, and follows the scientific, systematic and operability principles of index selection.

3.1. Constructing the evaluation index system of rural ecotourism resources

Referring to the tourism resources evaluation standards in China, consulting the relevant literature on the development of rural ecotourism resources and rural tourism development [2-6], and combining the characteristics of rural ecotourism resources in Shanghai and the suggestions of experts, therefore, the evaluation indicator system of agro-ecotourism resources is constructed. As shown in the figure 1, setting the target layer as the evaluation system of rural ecotourism resources in Shanghai, and constructing the system layer from three aspects of resources value, ecological environment and development conditions, considering the advantages and disadvantages of the three parts in
3.2. Constructing judgment matrix

After establishing the evaluation indicator system of rural eco-tourism resources, starting from the target layer, the elements in the next layer are compared with each other, and the judgment matrix is constructed. Among them, the 1-9 scale method, which is widely used at present, is used as the scale of the importance of two-to-two comparison. By means of questionnaire, 9 experts were asked to grade and make group decision, and a judgment Matrix was constructed.

A is the target, and ui, uj (i, j = 1, 2, ..., n) are the factors. \( u_{ij} \) represents the value of the relative importance of the \( u_i \) to the \( u_j \). And A-U judgment matrix \( P \) is composed of \( u_{ij} \).

\[
P = \begin{bmatrix}
    u_{11} & u_{12} & \cdots & u_{1n} \\
    u_{21} & u_{22} & \cdots & u_{2n} \\
    \vdots & \vdots & & \vdots \\
    u_{n1} & u_{n2} & \cdots & u_{nn}
\end{bmatrix} \quad (1)
\]

3.2. Sort of computational importance

According to the judgement matrix, the characteristic vector \( w \) corresponding to \( \lambda_{\text{max}} \) is obtained. The equation is as follows:

\[
Pw = \lambda_{\text{max}} w \quad (2)
\]

The obtained feature vector \( w \) is normalized to rank the importance of each evaluation factor, that is, to assign the weight.

3.3. Consistency checking

It is necessary to check the consistency of the judgment matrix if the weight distribution is reasonable. Check the formula:

\[
CR = \frac{CI}{RI} \quad (3)
\]

In the formula, \( CR \) is the random consistency ratio of judgment matrix; \( CI \) is the consistency index of judgment matrix. It is given by:
\[ CI = \frac{\lambda_{\text{max}} - n}{n-1} \]  

RI is the average random consistency index of the judgment Matrix. The RI values of the judgment matrix of order 1-9 are shown in the table below.

| n   | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
|-----|----|----|----|----|----|----|----|----|----|
| RI  | 0  | 0  | 0.52 | 0.89 | 1.12 | 1.26 | 1.36 | 1.41 | 1.46 |

When CR<0.1 or \( \lambda_{\text{max}} = n \), CI = 0, the judgement matrix P has satisfactory consistency, otherwise, it is necessary to adjust the elements in P.

Using Yahhp software to calculate the weight of rural eco-tourism resources evaluation judgment matrix, the data are as follows: table 2-6 [7].

### 3.4. Factor Scores

According to the established evaluation index, the questionnaire was distributed among the professionals related to rural tourism in Shanghai, with a total of 33 questionnaires, 33 returned, 32 valid, and an effective rate of 97.1%. The score of 18 indexes is multiplied by the weight of each index, and the comprehensive evaluation layer score is obtained. The specific formula is shown in formula (5). The scores of the comprehensive evaluation layers are added up to the total score.

\[ A = \sum_{i=1}^{n} s_i \times w_i \]  

### 4. Result analyses

Table 2 shows that in the comprehensive evaluation level, the weight distribution of three parts: resource values (0.4666) > ecological environment (0.3181) > development conditions (0.2153), which shows that Resource values is the most important factor in the development of rural ecotourism in Shanghai, the ecological environment and exploitation conditions are the important restrictive factors.

|    | A   | B1  | B2  | B3  | Wi  |
|----|-----|-----|-----|-----|-----|
| B1 | 1   | 1.066 | 2.984 | 0.467 |
| B2 | 0.938 | 1   | 1.074 | 0.318 |
| B3 | 0.335 | 0.931 | 1   | 0.215 |

\[ \lambda_{\text{max}}=3.1029; \text{CI}=0.0515; \text{CR}=0.097<0.1 \]

In Table 3, "recreational value", "agricultural experience value" and "ecological value" are the most influential factors. Shanghai residents go to rural eco-tourism areas to enjoy the natural scenery, enjoy flowers, pick fruits and other relaxing activities. The very high degree of participation in agricultural experience activities is an important experience in rural eco-tourism activities.

|    | B1  | C1  | C2  | C3  | C4  | C5  | C6  | C7  | Wi  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| C1 | 1   | 2.828 | 2.901 | 0.957 | 3.086 | 0.907 | 2.969 | 0.242 |
| C2 | 0.354 | 1   | 0.895 | 1.006 | 2.935 | 0.977 | 0.948 | 0.131 |
| C3 | 0.345 | 1.118 | 1   | 0.261 | 3.171 | 0.851 | 0.285 | 0.092 |
| C4 | 1.045 | 0.994 | 3.828 | 1   | 0.883 | 0.978 | 0.958 | 0.158 |
| C5 | 0.324 | 0.341 | 0.315 | 1.132 | 1   | 0.979 | 0.246 | 0.069 |
| C6 | 1.102 | 1.024 | 1.175 | 1.022 | 1.021 | 1   | 1.037 | 0.140 |
| C7 | 0.339 | 1.055 | 3.515 | 1.044 | 4.063 | 0.96  | 1   | 0.168 |

\[ \lambda_{\text{max}}=7.8137; \text{CI}=0.1356; \text{CR}=0.0997<0.1 \]

As shown in Table 4, "pollution control capacity" and "environmental health status" are the biggest influencing factors; the most important thing for citizens to travel at rural areas is to value their natural environment, breathing fresh air.

|    | B2  | C8  | C9  | C10 | C11 | C12 | Wi  |
|----|-----|-----|-----|-----|-----|-----|-----|

4
As can be seen from table 5, "transportation convenience" and "location conditions" are the top influencing factors; location conditions and transportation convenience determine the accessibility of rural tourist destinations. One-day trip is the main way for citizens to travel to the countryside and the distance and location are important factors to consider. "tourism facilities" is to determine the satisfaction from tourists, but also to extend the length of stay of tourists is the main factor. The development of rural tourism cannot be separated from policy support.

Table 5. Judgment matrix of development conditions

| B3 | C13 | C14 | C15 | C16 | C17 | C18 | Wight |
|----|-----|-----|-----|-----|-----|-----|-------|
| C13 | 1   | 1.905 | 0.730 | 0.767 | 1.745 | 4.790 | 0.214 |
| C14 | 0.525 | 1   | 3.753 | 0.838 | 3.380 | 3.504 | 0.243 |
| C15 | 1.371 | 0.267 | 1   | 2.360 | 2.253 | 3.056 | 0.199 |
| C16 | 1.304 | 1.194 | 0.424 | 1   | 3.276 | 2.755 | 0.199 |
| C17 | 0.573 | 0.296 | 0.444 | 0.305 | 1   | 0.883 | 0.078 |
| C18 | 0.209 | 0.285 | 0.327 | 0.363 | 1.132 | 1   | 0.066 |

\(\lambda_{max}=6.6273; CI=0.1255; CR=0.0986<0.1\)

5. Conclusions

In this study, AHP method is used to construct the evaluation index of Shanghai rural eco-tourism resources. For the comprehensive evaluation level, "Resource values" and "ecological environment" have the highest weight, the total weight is close to 80%, it is the core and key to evaluate the rural eco-tourism resources in Shanghai, and the weight of "development conditions" is about 20%. In the index layer, the top five indexes are "recreational value", "pollution control ability", "agricultural experience value", "ecological value" and "environmental health status". Total weight over 40%.

Table 6. Weight distribution and Scoring of rural ecotourism resources evaluation index system in Shanghai

| Target | Score | Comprehensive evaluation | Weight | Score | Indicator | Weight | Score |
|--------|-------|--------------------------|--------|-------|-----------|--------|-------|
| A      | 80.336| B1 0.467 37.524          | C1     | 0.113 | 71.41     | C2     | 0.061 | 69.37 |
|        |       |                          | C3     | 0.043 | 74.64     | C4     | 0.074 | 73.75 |
|        |       |                          | C5     | 0.032 | 65.36     | C6     | 0.066 | 72.51 |
|        |       |                          | C7     | 0.079 | 81.89     | C8     | 0.096 | 83.63 |
|        |       |                          | C9     | 0.074 | 85.72     | C10    | 0.051 | 75.45 |
|        |       |                          | C11    | 0.049 | 78.32     | C12    | 0.048 | 75.66 |
|        |       |                          | C13    | 0.046 | 81.31     | C14    | 0.072 | 87.53 |
|        |       |                          | C15    | 0.035 | 72.61     | C16    | 0.026 | 79.54 |
|        |       |                          | C17    | 0.018 | 67.48     | C18    | 0.018 | 69.82 |

More than half of them are related to the environment. Therefore, the ecological environment is very important to the evaluation of rural eco-tourism resources in metropolis.
Using the rural ecotourism resources evaluation model constructed in this paper, the rural ecotourism resources in Shanghai are evaluated. According to the standard of tourism resources classification in China, when the score is 75-89, it is rated four-level resources, the rural eco-tourism resources in Shanghai were rated as 80.336, with a higher resource level. The specific scores of the comprehensive evaluation layer and the indicator layer are as follows: From the specific scores, it can be seen from table 6 that the overall score of the "resource values" is not high, but the score of the "ecological environment" part is relatively high. In recent years, according to the implementation of the rural revitalization strategy and the development of modern urban green agriculture in Shanghai, with Green, low-carbon and circular development as the main objectives, an environmental protection action plan has been launched on the basis of resolutely tackling rural pollution in agriculture, we will accelerate the development of green agriculture, which is characterized by efficient production, safe production, resource conservation and environment-friendly, and promote the coordinated, healthy and sustainable development of the ecological environment and agricultural production. In 2018, the EI of Shanghai was 62.40, the eco-environmental assessment grade was "good", the vegetation coverage was high and the biodiversity was rich, according to the data of the bulletin of the state of ecological environment of Shanghai 2019 the accuracy rate of waste classification continued to rank first in the country [8]. Therefore, it lays a good ecological foundation for the development of rural eco-tourism in Shanghai.

"Cultural value" is scored the lowest among the "resource values", which shows that the current Shanghai rural eco-tourism, cultural elements of the excavation is far from enough. Shanghai is one of the most developed cities in China. Shanghai has a distinct advantage in its location, convenient transportation and complete infrastructure. Relatively speaking, "the service management level" also has the very big promotion space. The support of local residents is very important to the development of rural tourism, and local government need strengthen communication and publicity with local residents.

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References
[1] SaatyT L. The Analytic Hierarchy Process: Planning.Priority Setting. Resource Allocation. New York: McGrawHill.1980. p287
[2] Li Ying. The construction of evaluation index system of agricultural ecotourism resources in Zhejiang province. Chinese Journal of Agricultural Resources and Regional Planning. Vol. 39. No. 11. November.2018.pp.178-182
[3] Wang Qianying. The distribution and value analysis of agricultural tourism resources in Heilongjiang province, Chinese Journal of Agricultural Resources and Regional Planning. Vol. 40. No. 8. August.2019.pp.240-245
[4] Zhang Dongyue. Study on classification and evaluation of rural tourism resources in Luoyang city, Chinese Journal of Agricultural Resources and Regional Planning. Vol. 40. No. 8. August.2019. pp.74-79
[5] Wang Cuiping. An empirical research on the evaluation system of agricultural ecotourism resources: taking " Huguan MT. Taihang grand canyon spot " as an example. Chinese Journal of Agricultural Resources and Regional Planning. Vol. 39. No. 1. pp.66-70.98 January.2018. pp.66-70
[6] Zhang Jinjiang. Study on evaluation of agricultural ecotourism resources in Shanxi province. Chinese Journal of Agricultural Resources and Regional Planning. Vol. 40.No. 12, December.2019. pp.276-282
[7] Zhang Jianhua. Combination evaluation method of Analytic Hierarchy Process and Fuzzy Comprehensive Evaluation based on yaahp[OL]. http://www.jeffzhang.cn/yaahp-fce-introduction. March 25.2015.

[8] Bulletin on the state of the ecological environment in Shanghai 2019. https://sthj.sh.gov.cn/hbzhywpt1143/hbzhywpt1144/20200603/6cd3315edcd42fb871f07ebc5e9ef3b.html