Rural Tourism Resource Evaluation Based on Computer Analytic Hierarchy Process

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Abstract. After the CPC central committee put forward the construction of a new socialist countryside, rural tourism has been favored by more and more tourists and has become an important part of the development of China's tourism industry. In recent years, the development of rural tourism has also presented a new trend, and many new rural tourism projects suitable for regional development have been developed. Based on the analysis of the current situation of rural tourism development, an evaluation system based on the characteristics of rural tourism resources is established by using computer analytic hierarchy process (ahp). And select representative rural tourism scenic spots for empirical research to provide scientific basis for the development of rural tourism resources.

Keywords: Rural Tourism Resources, Quantitative Evaluation, Delphi Method, AHP, Computer Technology

1. Introduction
Since the reform and opening up, with the rapid development of economy and the deterioration of urban environment [1-2], citizens increasingly miss the open fields and green nature. Returning to nature has become a fashion [3-4]. In this context, rural tourism emerges as the times require. It not only provides a leisure and relaxing environment for the citizens, but also brings great benefits to the local people[5-6]. With the national tourism theme “China Rural Tourism 0” in 2006 and “China harmonious urban and rural tourism 0” in 2007, rural tourism has become an important form of tourism development in China and one of the driving forces of building a new socialist countryside.

Rural tourism started in the late 1990s. Since 2003, a large number of rural tourist attractions in the main form of “Agritainment” have appeared in rural counties, which have received unprecedented attention in the city and began to move towards the track of standardized development. This paper takes the evaluation of rural tourism resources as an empirical study. Based on the combination of Delphi and AHP, and referring to other evaluation methods and national standards of tourism resources evaluation, an evaluation system based on the characteristics of rural tourism resources is established. Each link of tourism resources evaluation in rural tourism development is discussed, and the typical tourist attractions of the city are selected for empirical evaluation. Rural tourism is a new type of tourism development. Quantitative evaluation of rural tourism resources is an important aspect of research on new rural construction and planning, and also a hot spot of current research. Empirical
quantitative evaluation of rural tourism resources has great theoretical and application value.

2. Development of Rural Tourism

Rural tourism was originated in Europe in the 19th century. It refers to a new type of tourism management activity that provides people with sightseeing, leisure, vacation, experience, entertainment and fitness through scientific planning, development and design by using the natural environment, rural landscape, agricultural production, farming culture, folk culture, ancient towns, villages, rural life and other resources. As the name suggests, rural tourism resources should be located in the rural area from the perspective of regional scope, from the perspective of content, the tourism resources in the rural area are rich and colorful, including natural tourism resources such as local cultural landscape, water scenery, biological landscape, as well as leisure and fitness, shopping and other human tourism resources. In a word, rural tourism resources refer to the rural landscape resources existing in the rural area, which can attract tourists to carry out tourism activities, and can produce economic, social, ecological and other comprehensive benefits. As a rural tourism resource, the rural landscape should have both the function of attraction and the function of comprehensive benefit. It should be the object of tourism activities for better protection of ecological and beautiful enjoyment.

![Development model of rural tourism](image)

**Figure 1. Development model of rural tourism**

3. Quantitative Evaluation of Rural Tourism Resources

Based on the principles of practicability, comprehensiveness, representativeness, scientific nature and operability, this paper divides the overall goal into three levels of comprehensive evaluation: resource conditions, development conditions and tourism conditions, and then subdivides them into eight project evaluation levels such as recreation characteristics and 16 factor evaluation levels such as pleasure. Considering that the difficulty and workload of Delphi increase with the increase of the number of indexes, even it is difficult to get satisfactory results. While AHP is simple to determine the weight, but with the increase of the judgment matrix, there are contradictions before and after, and the error rate of judgment is very high, which is difficult to meet the requirements of consistency. Therefore, in this paper, Delphi method and AHP method are used to establish the evaluation system for rural tourism resources characteristics, and six typical rural tourism scenic spots are selected for empirical evaluation.

The hierarchical analysis of a picture is defined as the convolution of a spatial change function $G(x,y,\sigma)$ and the original picture $I(x,y)$ by the coordinates of $L(x,y,\sigma)$. 
\[ L(x, y, \delta) = G(x, y, \delta) * I(x, y) \quad (1) \]

To identify the special points of spatial scale, each acquisition point should be compared with all the points around it, and whether each point can be larger or smaller than all the points around it. According to the comparison of the special points of the center and its 8 points on the same coordinate and 18 points on the upper and lower vector coordinates, 26 points in total can be determined to find out the special points.

Based on the fitting function, the size and coordinate position of special points can be accurately calculated, and the uncertainty of salt and edge corresponding points with relatively low contrast of special points can be eliminated at the same time. Therefore, the stability and noise resistance of pairing can be improved.

Acquisition of fitting function at key points,

\[ D(X) = D + \frac{\partial D^T}{\partial X} X + \frac{1}{2} X^T \frac{\partial^2 D}{\partial X^2} X \quad (2) \]

Assuming that the equation is equal to zero and derivative, and get the following extreme points:

\[ X = - \frac{\partial^2 D^{-1}}{\partial X^T} \frac{\partial D}{\partial X} \quad (3) \]

According to the corresponding extreme point, the equation value can be obtained as follows:

\[ D(X) = D + \frac{1}{2} \frac{\partial D^T}{\partial X} X \quad (4) \]

The value of \( D(X) \) and the low-contrast special point of imbalance are of great use. Usually, the extreme point of \( |D(X)| < 0.03 \) is used to express the low-contrast special-point of imbalance for exclusion.

Among the eight factors in the project evaluation level, the recreational characteristics rank first (20 points), suggesting that rural tourism brings the greatest enjoyment to the urban residents is its appreciation and pleasure. This is the main factor of tourism attraction in a region. In the development of tourism resources, we should fully leverage this advantage, pay special attention to the strict protection of the recreational value of resources to prevent man-made damage. Secondly, infrastructure (16 points), cultural value (14 points) and regional conditions (13 points). If a scenic spot has a high popularity and the role of science and culture popularization, its attraction to tourists will significantly increase. Rural tourism also needs strong regional background as support. In areas with high economic level, the more driving force citizens have to travel. In addition, the infrastructure of rural tourism, such as transportation, communication, health care and environmental quality, is the prerequisite for the development of tourism. Currently, China is vigorously building a new rural area, and a large number of government investment to improve rural infrastructure, which is a rare opportunity for the development of rural tourism. In other aspects, scenic spot scale (11 points), policy factors (9 points), management level (7 points) and reception conditions (10 points) are also very important for the development of rural tourism.

**Table 1. Evaluation method for each index**

| Index                  | Evaluation method                              | Index                  | Evaluation method                              |
|------------------------|-----------------------------------------------|------------------------|-----------------------------------------------|
| Sense of pleasure      | Questionnaire analysis                        | geographic conditions  | on-the-spot investigation                      |
| Integrity              | Research and expert evaluation                | Traffic communication  | Per capita Road area, website                  |
| Suitable travel period | Characteristics of the scenic spot and local natural conditions | Medical and health work | Number of beds per thousand, medical staff per thousand |
| Popularity             | International and local attractions rating    | environmental          | Accommodation conditions,                      |
To reduce the subjectivity of the scoring process and make the evaluation results more scientific, the following principles shall be followed: 1) For the indexes of existing national standards or international standards, the specified standard value shall be used as much as possible, 2) Current value of foreign rural tourist attractions with good characteristics shall be used as the standard value, 3) Reference background value or background value standard, i.e., the background value of the evaluation area, or the background value before tourism development is the standard, 4) questionnaire survey and analysis, 5) Expert scoring (Table 1).

According to the first-hand data obtained based on the above evaluation method, after sorting and analysis, each index is normalized to obtain an original data value, and then according to the original data value, experts and researchers make evaluation and scoring according to the weight of each index.

### 4. Empirical Study

According to the classification in the “National standard of the people's Republic of China”, tourism resources are investigated and analyzed, and tourism evaluation framework is developed by some foreign scholars. The evaluation index system is classified according to three levels of “very satisfied”, “satisfied” and “general”. The total quantitative score is 100 points, as shown in Table 2.

According to the above factor parameter values, this paper mainly selects 8 representative rural tourism resource monomers for sub scoring, obtains the total score of each tourism monomers, and combines with the evaluation system quantitative table in Table 2, divides these 8 typical tourism resources into 4 grades, as shown in Table 3.

### Table 2. Quantification of the rural tourism evaluation index system

| Evaluation index level | Very satisfied (100 points in total) | Satisfied (79~65 score) | Commonly (64~0 score) |
|------------------------|-------------------------------------|-------------------------|-----------------------|
| Plantation economy     | 100~80 score                        | 79~65 score             | 64~0 score            |

With the continuous promotion of urban-rural integration and new rural construction, this aspect will be greatly improved. In addition, to encourage and guide the healthy, orderly and sustainable development of rural tourism and promote the development of “three rural” undertakings in the city, the Tourism Bureau of the city and the Agriculture Bureau of the city jointly developed 5 rural tourism development plans 6. Therefore, the future development of rural tourism in the city will have great market potential and broad prospects for development.

### 5. Conclusions

As one of the leading industries in the city, the development of rural tourism can be a supplement to that of the city's tourism, blazing a new trail for developing the city's tourism. As a link connecting the common development of urban and rural economy, the development of rural tourism has not only provided the urban residents with places for leisure, entertainment, and vacation, but also brought economic benefits to the vast number of farmers, making a great contribution to the construction of new rural areas in the city.

### References

[1] C.-S. Li. (2013). Evaluation on enterprise resource planning project based on fuzzy-ahp. Lecture Notes in Electrical Engineering, 220, 437-442.
[2] Y.-P. Zhou, S.-Q. Ma, & Q.-Y. Hao. (2014). Construction of evaluation index system for ecotourism city based on information entropy and ahp. Advances in Intelligent Systems and Computing, 254, 93-101.

[3] Zhenlong Zhang, & Rui Peng. (2011). Evaluation of intensive land use and the growth patterns in urban fringe: using ahp and gis methods. International Conference on Geoinformatics, 1-4.

[4] Ying Xiang, & Jinchang Li. (2014). Evaluation of ehr in health care in china: utilizing fuzzy ahp in swot analysis. Lecture Notes in Electrical Engineering, 269, 2715-2719.

[5] Guozhong Huang, Siheng Sun, & Dingli Zhang. (2018). Safety evaluation of construction based on the improved ahp-grey model. Wireless Personal Communications, 103(1), 1-11.

[6] Zhiping Zhou, & Kai Liang. (2013). Network course evaluation system based on ahp theory. Lecture Notes in Electrical Engineering, 205, 569-575.