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The Development Analysis of Leisure Agriculture in Xinxiang City, Henan Province Based on GAHP-SWOT

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Abstract

Leisure agriculture is an industry which combines the agricultural production and leisure recreation. In order to promote the development of leisure agriculture, it is particularly important to conduct an analysis of its development from the overall perspective of the city. This paper takes Xinxiang City of Henan Province in China as an example and adopts GAHP-SWOT as the analysis method. Based on affirming the influencing factors of advantages, disadvantages, opportunities and threats, the AHP method is adopted to calculate the weights of different factors and sort them so as to realize the organic combination of the qualitative and quantitative analysis. Group Decision is used in computation to exert the collective intelligence. The result shows that the indicators S4 and S3 are relatively high-weight advantages while the indicators W1 and W4 are relatively high-weight disadvantages, and the indicators O4 and O2 are relatively high-weight opportunities while the indicators T5 and T2 are relatively high-weight threats. The development strategy was put forward according to the analysis result in order to provide decision-making basis for the development planning of leisure agriculture in Xinxiang City.

Keywords*: SWOT, AHP, group decision-making, leisure agriculture, development*

1. Introduction

With the development of urbanization and improvement of people's living standards, tourism has developed quite rapidly, and ecotourism has become a very popular type of tourism. Leisure agriculture, which is an industry combining agricultural production and leisure recreation, has developed quite rapidly in recent years and has become an important part of ecotourism [1]. Leisure agriculture has many forms such as city farms, staying in farmers' houses, agricultural technology demonstration zones, agricultural leisure resorts and so on [2-4]. A great number of leisure agriculture parks have been built around big cities in China such as Beijing, Shanghai, Guangzhou, Hangzhou and so on, becoming important tourist destinations [5-7]. Chinese governments of all levels attach great importance to the development of leisure agriculture because it plays an important role in facilitating the adjustment of agricultural industry structure. "National Modern Agricultural Development Planning (2011 - 2015)" issued by China State Council, "The Twelfth Five-Year Plan on National Development of Leisure Agriculture" issued by Ministry of Agriculture of People's Republic of China, and "Development of Agriculture and Rural Economy" issued by Henan Province all clearly support the development of leisure agriculture. According to the data from the website of Agriculture Department of Henan Province, there are 623 touring agricultural parks in Henan province, the annual income of which has reached 1.6 billion Yuan.

The development of leisure agriculture plays an important role in promoting the development of agricultural economy and increasing farmers' income. In addition to its

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high economic and social benefits, it also has functions of protecting the ecological environment and providing popular science education and places for relaxation. However, there are a lot of problems in the process of development of leisure agriculture such as lack of features owing to the same development, low competitiveness because of ambiguity of market positioning and low level of service due to lack of professionals. Therefore, the development of leisure agriculture needs scientific analysis. Studying the method of developmental analysis is indeed necessary.

SWOT is an important way of development analysis and is widely used in industrial development decision such as industry, agriculture, service, manufacture and tourism [8-10]. The SWOT analysis is used for identifying the strength, weakness, opportunity and threat of the industry so that the development strategy can be organically combined with internal resources and external environment. The SWOT method mainly adopts qualitative assessment, but the drawback is that the evaluation experts' knowledge, experience and preference play a dominant role, which has greater subjective arbitrariness. In order to make up for the deficiency of qualitative assessment, AHP and SWOT analysis will be integrated to achieve the combination of qualitative and quantitative assessment. AHP is a handy, flexible and practical multi-criteria decision-making method, which conducts quantitative analysis to qualitative problems [11]. It is widely applied not only in industry, agriculture and the tertiary industry but also in the development assessment of leisure agriculture. Taking advantage of collective intelligence is an important way to improve the accuracy of evaluation. Group decision is a decision-making method based on the analysis and collection of preference of each member in the group to draw a conclusion of group preference as the ground of decision-making [12]. This research tries to use GAHP-SWOT method to analyze the Xinxiang City of Henan Province in development of leisure agriculture.

2. Method and Model

2.1 Method

The calculating procedure of GAHP-SWOT model is shown below:

(1) SWOT analysis Determine the influencing factors of S, W, O and T, of which S (strengths) and W (weaknesses) are internal factors while O (opportunities) and T (threats) are external factors.

(2) Establishing the hierarchical model. Form the hierarchical structure made up of target layer, criteria layer and index layer according to the dominance relationship.

(3) Calculating relative weights. Judged by specialists respectively. To confirm the rank of importance of relevant elements (relative weight) in this hierarchy for a certain element in the last hierarchy by building 2 matrices for comparison and judgment (1-9 scale) and mathematical methods of matrix manipulation.

(4) The overall ranking of hierarchy. Calculating synthetic weights of each hierarchy of the target element system and making total sorting to determine the importance of each element at the lowest hierarchy of hierarchical structure graph among the general goal.

(5) Analysis of developing strategies.

2.2 GAHP-SWOT Model

2.2.1 Selection of Indicators: According to the current situation of leisure agriculture in Xinxiang City, Henan Province, the influencing factors of SWOT can be determined after combining the suggestion from college teachers, the government department of agriculture, investors and tourists.

Table 1. The Influencing Factors and Explanations of SWOT

Category	Factor	Explanation
Strength(S)	Location(S1)	Within the scope of the Central Plains Economic Zone
	Traffic(S2)	Developed expressways; equipped with high-speed railways and regular railways
	Market(S3)	It has a large population, and the city's economic development is in the middle level
	Industry(S4)	Relatively favorable foundation for agricultural industry
	Infrastructure(S5)	Sound facilities for road, electric power and irrigation and water conservancy of farmland
Weakness(W)	Lack of planning(W1)	Lack of unified planning and chaotic construction
	Monotony of projects(W2)	The projects are relatively single and similar and lack well-known brands
	Employees(W3)	Employees' quality fails to meet the need of management
	Characteristic resources (W4)	Located in plain areas, it lacks characteristic resources
	Cultural resources(W5)	The reserved agricultural cultural resource is relatively short.
Opportunity(O)	Land circulation (O1)	The implementation of land circulation system provides the basic foundation for zonation
	Policy support (O2)	Government encourages the adjustment of agricultural structure and the development of leisure agriculture
	The rise of tourism(O3)	The consumption of leisure agriculture is strong with relatively high attraction.
	Financial support(O4)	Government offers financial support
	Improvement in disposable incomes(O5)	Rise in disposable income of residents per capita and great potential of consumption on leisure agriculture
Threat(T)	Fund guarantee(T1)	The output of the agriculture investment is slow, needing fund guarantee.
	Marketing strategy(T2)	Marketing strategy is key to sustainable development of leisure agriculture
	Environmental pollution(T3)	Air, water source and soil pollution caused by industrial development
	Substitutability(T4)	The construction of leisure agriculture is of low complexity, which is easy to be replaced
	Competition in tourism from the surrounding areas(T5)	Development of Leisure Agriculture is also rapid in the adjoining areas such as Zhengzhou, Kaifeng, Jiaozuo and so on

2.2.2 Foundation of Model: Build a model as Figure 1 in Yaahp software (Figure 1).

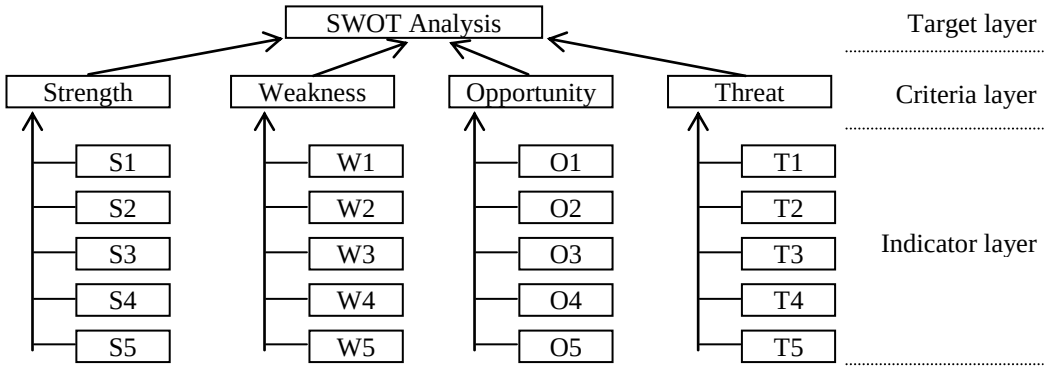

Figure 1. Diagrammatic Sketch of AHP Model

2.3 Calculating Software

The calculation process of AHP is relatively simple, but it is also hard to some degrees for non-professionals in math. Currently, there are many software programs in the market which can be used to do the AHP calculation, and they provide convenience for the promotion and application of AHP. The common programs include Expert Choice, Super Decision, etc. This study adopts the software Yaahp 0.53, which provides the programming function of AHP computation and has been widely applied due to its user-friendly interface and easy operation.

3. Results and Discussion

3.1 Comparison Matrix

Five professors (E1-E5) from Henan Institute of Science and Technology are chosen as evaluation experts, all of whom are rich in leisure agriculture planning experience. Each expert is assigned with the same weighting factor, 0.2. The arithmetic mean is adopted as the aggregation method for the judgment of matrix (Table 2-Table 7).

Table 2. Criteria Layer's Judgment Matrix to Target Layer and Weight of Criteria (E1-E5)

Expert 1: C.R.=0.0854<0.1					
SWOT	S	W	O	T	Wi
S	1	5	2	4	0.4768
W	1/5	1	1/4	1/3	0.0681
O	1/2	4	1	5	0.3371
T	1/4	3	1/5	1	0.1180
Expert 2: C.R.= 0.0456<0.1					
SWOT	S	W	O	T	Wi
S	1	6	4	4	0.5744
W	1/6	1	1/4	1/4	0.0586
O	1/4	4	1	1	0.1835
T	1/4	4	1	1	0.1835
Expert 3: C.R.= 0.0805<0.1					
SWOT	S	W	O	T	Wi

S	1	2	1/3	2	0.2458
W	1/2	1	1/2	1/2	0.1360
O	3	2	1	2	0.4258
T	1/2	2	1/2	1	0.1924
Expert 4: C.R.= 0.0815<0.1					
SWOT	S	W	O	T	Wi
S	1	1	1/3	2	0.1882
W	1	1	1/3	1/2	0.1331
O	3	3	1	5	0.5394
T	1/2	2	1/5	1	0.1393
Expert 5: C.R.= 0.0869<0.1					
SWOT	S	W	O	T	Wi
S	1	7	1/3	4	0.3212
W	1/7	1	1/5	1	0.0755
O	3	5	1	4	0.5114
T	1/4	1	1/4	1	0.0919

Table 3. Indicator Layer's Judgment Matrix to Criteria Layer and Weight of Indicator (E1)

S	S1	S2	S3	S4	S5	Wi
S1	1	1	2	1	2	0.2316
S2	1	1	3	3	3	0.3394
S3	1/2	1/3	1	1/3	3	0.1227
S4	1	1/3	3	1	4	0.2316
S5	1/2	1/3	1/3	1/4	1	0.0746
W	W1	W2	W3	W4	W5	Wi
W1	1	1/3	2	1/2	1/2	0.1203
W2	3	1	2	1/5	1/2	0.1555
W3	1/2	1/2	1	1/3	1/2	0.0912
W4	2	5	3	1	3	0.4235
W5	2	2	2	1/3	1	0.2095
O	O1	O2	O3	O4	O5	Wi
O1	1	1/3	1	1/5	1/3	0.0758
O2	3	1	3	1	4	0.3324
O3	1	1/3	1	1/3	3	0.1303
O4	5	1	3	1	4	0.3682
O5	3	1/4	1/3	1/4	1	0.0932
T	T1	T2	T3	T4	T5	Wi
T1	1	1/2	1/3	1/3	1/3	0.0749
T2	2	1	3	3	1/2	0.2582
T3	3	1/3	1	1	1/4	0.1261
T4	3	1/3	1	1	1/4	0.1261
T5	3	2	4	4	1	0.4146
C.R. respectively are: 0.0768, 0.0987, 0.0876 and 0.0803						

Table 4. Indicator Layer's Judgment Matrix to Criteria Layer and Weight of Indicator (E2)

S	S1	S2	S3	S4	S5	Wi
S1	1	6	2	2	3	0.4038
S2	1/6	1	1/2	1/3	1/2	0.0730
S3	1/2	2	1	1	1/3	0.1378
S4	1/2	3	1	1	2	0.2138
S5	1/3	2	3	1/2	1	0.1717
W	W1	W2	W3	W4	W5	Wi
W1	1	3	3	1	3	0.3331
W2	1/3	1	1/2	1/3	2	0.1110
W3	1/3	2	1	1/3	1/3	0.1024
W4	1	3	3	1	3	0.3331
W5	1/3	1/2	3	1/3	1	0.1204
O	O1	O2	O3	O4	O5	Wi
O1	1	4	1/2	1/3	2	0.1806
O2	1/4	1	1/3	1/4	1/3	0.0631
O3	2	3	1	1/3	1/2	0.1705
O4	3	4	3	1	2	0.4010
O5	1/2	3	2	1/2	1	0.1849
T	T1	T2	T3	T4	T5	Wi
T1	1	1/3	4	3	1/3	0.1658
T2	3	1	3	3	1/2	0.2634
T3	1/4	1/3	1	3	1/5	0.0860
T4	1/3	1/3	1/3	1	1/5	0.0587
T5	3	2	5	5	1	0.4263
C.R. respectively are: 0.0668, 0.0995, 0.0899 and 0.0843						

Table 5. Indicator Layer's Judgment Matrix to Criteria Layer and Weight of Indicator (E3)

S	S1	S2	S3	S4	S5	Wi
S1	1	1/4	1/4	1/6	1/3	0.0508
S2	4	1	1/3	1/4	2	0.1454
S3	4	3	1	2	3	0.3708
S4	6	4	1/2	1	3	0.3228
S5	3	1/2	1/3	1/3	1	0.1102
W	W1	W2	W3	W4	W5	Wi
W1	1	3	3	1/2	2	0.2524
W2	1/3	1	1/2	1/4	1/2	0.0750
W3	1/3	2	1	1/4	4	0.1500
W4	2	4	4	1	4	0.4292
W5	1/2	2	1/4	1/4	1	0.0934
O	O1	O2	O3	O4	O5	Wi

O1	1	1/6	1/3	1/4	1/3	0.0510
O2	6	1	5	1/2	4	0.3391
O3	3	1/5	1	1/4	1/3	0.0821
O4	4	2	4	1	4	0.3945
O5	3	1/4	3	1/4	1	0.1333
T	T1	T2	T3	T4	T5	Wi
T1	1	2	1/2	1	1/4	0.1297
T2	1/2	1	1	3	1/3	0.1489
T3	2	1	1	1	1/4	0.1489
T4	1	1/3	1	1	1/3	0.1102
T5	4	3	4	3	1	0.4622
C.R. respectively are: 0.0662, 0.0829, 0.0866 and 0.0906						

Table 6. Indicator Layer's Judgment Matrix to Criteria Layer and Weight of Indicator (E4)

S	S1	S2	S3	S4	S5	Wi
S1	1	1	1/3	1/2	1/2	0.1023
S2	1	1	1/3	2	1/5	0.1123
S3	3	3	1	4	3	0.4288
S4	2	1/2	1/4	1	1/2	0.1109
S5	2	5	1/3	2	1	0.2457
W	W1	W2	W3	W4	W5	Wi
W1	1	4	4	4	2	0.4375
W2	1/4	1	3	3	3	0.2429
W3	1/4	1/3	1	1	2	0.1159
W4	1/4	1/3	1	1	2	0.1159
W5	1/2	1/3	1/2	1/2	1	0.0878
O	O1	O2	O3	O4	O5	Wi
O1	1	1/2	1/3	1/6	2	0.0809
O2	2	1	4	1/4	4	0.2185
O3	3	1/4	1	1/4	4	0.1361
O4	6	4	4	1	6	0.5141
O5	1/2	1/4	1/4	1/6	1	0.0504
T	T1	T2	T3	T4	T5	Wi
T1	1	1/2	1/3	1/3	1/3	0.0718
T2	2	1	1/4	1/3	1/4	0.0845
T3	3	4	1	3	1/3	0.2622
T4	3	3	1/3	1	1/4	0.1506
T5	3	4	3	4	1	0.4309
C.R. respectively are: 0.0945, 0.0977, 0.0947 and 0.0959						

Table 7. Indicator Layer's Judgment Matrix to Criteria Layer and Weight of Indicator (E5)

S	S1	S2	S3	S4	S5	Wi
S1	1	1/3	2	1/4	1/3	0.0930
S2	3	1	2	1/3	3	0.2374
S3	1/2	1/2	1	1/4	1/3	0.0765
S4	4	3	4	1	2	0.4133
S5	3	1/3	3	1/2	1	0.1799
W	W1	W2	W3	W4	W5	Wi
W1	1	4	5	2	3	0.4165
W2	1/4	1	4	1	4	0.2110
W3	1/5	1/4	1	1/3	1/4	0.0534
W4	1/2	1	3	1	3	0.2160
W5	1/3	1/4	4	1/3	1	0.1030
O	O1	O2	O3	O4	O5	Wi
O1	1	2	2	1/3	1	0.1610
O2	1/2	1	1/2	1/6	1/4	0.0610
O3	1/2	2	1	0.1429	2	0.1183
O4	3	6	7	1	4	0.5275
O5	1	4	1/2	1/4	1	0.1323
T	T1	T2	T3	T4	T5	Wi
T1	1	1/3	4	1/3	1/3	0.1118
T2	3	1	3	1/2	1/2	0.1927
T3	1/4	1/3	1	1/3	1/5	0.0580
T4	3	2	3	1	1/3	0.2345
T5	3	2	5	3	1	0.4030
C.R. respectively are: 0.0834, 0.0917, 0.0753 and 0.0811						

Table 8. The Weight of Criteria Layer to the Target Layer, Indicator Layer to the Criteria Layer and the Overall Ranking Weights of Hierarchy

Target layer	Criteria layer	Local weight	Indicator layer	Local weight	Global weight
SWOT	S	0.3739	0.1625	S1	0.0608
			0.1891	S2	0.0707
			0.2148	S3	0.0803
			0.2615	S4	0.0978
			0.1720	S5	0.0643
	W	0.0902	0.2959	W1	0.0267
			0.1857	W2	0.0167
			0.1077	W3	0.0097
			0.2820	W4	0.0254
			0.1286	W5	0.0116
	O	0.3968	0.1111	O1	0.0441
			0.2010	O2	0.0798
			0.1414	O3	0.0561
			0.4127	O4	0.1638

			0.1337	O5	0.0530
	T	0.1392	0.1258	T1	0.0175
			0.1920	T2	0.0267
			0.1440	T3	0.0200
			0.1415	T4	0.0197
			0.3967	T5	0.0552

3.2 Result of Weight

According to table 8, to the overall target, the weights of S and O are higher, and the weights of W and T are lower. This means that as for the leisure agriculture development of Xinxiang City, the advantage is bigger than the disadvantage and the opportunity is bigger than the threat, so it has a relatively outstanding development potential. Therefore, Xinxiang City should seize the opportunity of development of leisure agriculture, bring its own superiority into full play, and create conditions for the development of leisure agriculture.

According to figure 2, S4 and S3 have higher weights among the advantages while W1 and W4 have higher weights among the disadvantages. Among the opportunities, O4 and O2 have higher proportions. Among the threats, T5 and T2 have higher proportions. These factors should all be given relatively more attention to.

According to figure 2, among the general sorting order of the hierarchy, factors such as O4 S4, S3, O2 and S2 have higher proportions which mean that they have bigger impacts on the development of leisure agriculture in Xinxiang City. In the future development of leisure agriculture, we should focus on using the conditions of S and O of higher weights and solving the problems of W and T of higher weights, thus create favorable conditions for the development of leisure agriculture.

4. Conclusion

Leisure agriculture is a combination of agriculture and leisure recreation, which has developed quite rapidly in recent years. Leisure agriculture has the major functions of agricultural production, environmental protection and leisure tourism, etc. Leisure agriculture has promoted the development of local agricultural economy as well as the increase of farmers' income, which has gained wide attention of the society. The development of leisure agriculture is restricted by a series of factors and conducting a reasonable analysis of these factors is the prerequisite for sustainable development. Applying the model of GAHP-SWOT in the analysis of Development of Leisure Agriculture and combining the qualitative and quantative analyses by gathering the group intelligence can be used to analyze deeply the problems in Development of Leisure Agriculture and provide a plausible resolution accordingly. The Yaahp software achieves the routinization of computation, and provides convenience for the dissemination and application of the method.

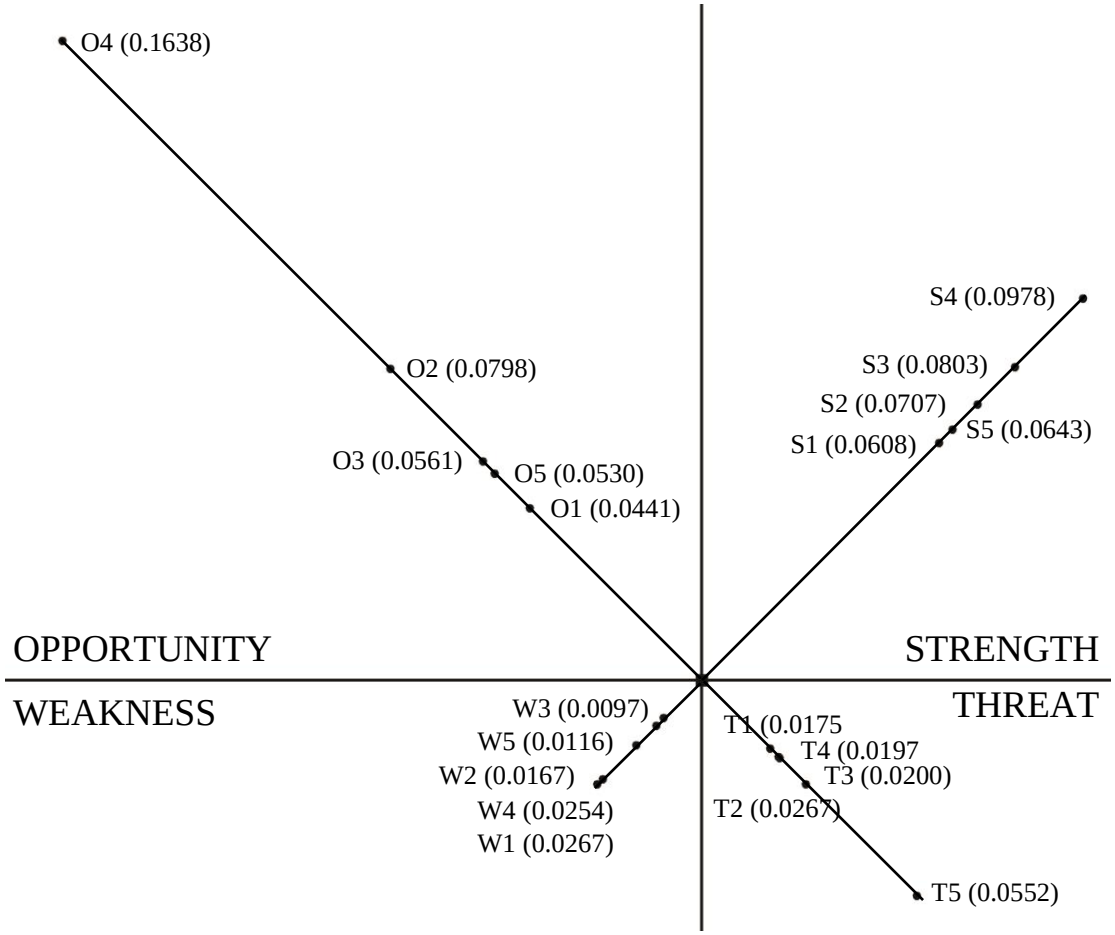

Figure 2. Diagrammatic Sketch of Global Weight for SWOT Factors

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