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## Article

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Journal of Industrial Engineering and Management (JIEM)

## Provided in Cooperation with:

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*Suggested Citation:* Zhang, Yichuan; Feng, Lei (2013) : Development assessment of leisure agriculture in Henan province of China based on SWOT-AHP method, Journal of Industrial Engineering and Management (JIEM), ISSN 2013-0953, OmniaScience, Barcelona, Vol. 6, Iss. 2, pp. 642-653,  
<https://doi.org/10.3926/jiem.738>

This Version is available at:

<https://hdl.handle.net/10419/188548>

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## Development assessment of leisure agriculture in Henan province of China based on SWOT-AHP method

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*Received: March 2013*

*Accepted: March 2013*

### **Abstract:**

**Purpose:** The development of leisure agriculture is an important means of agricultural industry structure adjustment of Henan province, China, to realize the transition from traditional agriculture to modern agriculture.

**Design/methodology/approach:** The SWOT (Strength, Weakness, Opportunity, Threat) analysis of Henan leisure agriculture will contribute to the sustainable development of Henan leisure agriculture. The strength, weakness, opportunity and threat of developing leisure agriculture in Henan province were systematically analyzed using SWOT method in our study. The aspects including location, resources, traffic, population, economy, urbanization, industrialization, market, policy, capital, product, technology, management, marketing and environment were involved. The strength, weakness, opportunity and threat were quantified in this study using AHP (Analytic Hierarchy Process) method.

**Findings:** The result showed that the total strength and total opportunity of Henan leisure agriculture are much greater than that of total weakness and total threat, which suggests that the opportunities outweigh threats, and advantage outweigh disadvantage. The growth-oriented strategy combining the external opportunities and its own advantages shall be employed in development of Henan leisure agriculture as indicated by the strategy strength coefficient in

strategy quadrangle we have constructed. The barriers to the development need to be overcome while strengthening competitive advantages.

**Originality/value** New ideas for working out the developmental strategy for Henan leisure agriculture is provided by SWOT-AHP method.

**Keywords** SWOT, AHP, leisure agriculture, developmental assessment, Henan

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## 1. Introduction

Leisure agriculture is one form of agriculture which relies on agricultural production and combines with modern tourism (Sanagustín, Moseñe & Gómez, 2011). Leisure agriculture has been developed rapidly in recent years. Plenty of leisure agriculture parks have been built around big cities such as Beijing, Shanghai, Guangzhou, Hangzhou, etc. These leisure agriculture parks often perform the functions of production, technology demonstration, ornamental, leisure, catering, vacation, cultural entertainment, shopping and so on. The construction of leisure agriculture has promoted the structural transition of agricultural industry, expanded the developmental space of agriculture, absorbed the surplus rural labors of country to employment and increased rural income. It makes great contribution to the improvement of ecological environment and tourist environment, and provides a leisure and recreational site for urban residents (Zhang, 2012).

It has been explicitly point out in "Several Opinions on Improving the Balance between Urban and Rural Development for Further Consolidation of the Foundation of the Development of Agriculture and Rural Areas" issued by the State Council in 2010 that leisure agriculture, rural tourism, forest tourism and rural service industry shall be developed vigorously to expand rural employment in non-rural industries. The development of suburban leisure agriculture shall be strongly supported and encouraged. The operation and managerial level of leisure agriculture parks shall be standardized and improved to satisfy the demand of consumers, increase rural incomes and promote the sustainable development of leisure agriculture. Leisure agriculture of Henan province has been developed rapidly in recent years. The leisure agriculture parks are usually distributed near Zhengzhou, Luoyang, Xinxiang, Xuchang and Kaifeng. The most famous among them are Henan Agricultural Hi-tech Park, Henan Golden Heron Ostrich Amusement Park, Zhengzhou Fengle Sunflower Park, Zhengzhou Erqi District Cherry Picking Park, Yanling National Flower Exposition Park in Xuchang, Xinxiang North Station Shili Agriculture Park, Luoyang Sunrain Leisure Agriculture Park, Luoyang Haotian High Efficiency Agriculture Picking Tourism Park, Vegetable Picking Park in Yechang Village, Development Region, Kaifeng City. Those leisure agriculture parks have become the major tourist spots for urban residents. The development of leisure agriculture enjoys broad prospect because of the

expanding market of Henan leisure agriculture and the rapidly increasing demand for leisure agriculture. The requirement of location, ecology, technology, profit-making and marketing for leisure agriculture is higher than that of traditional agriculture. Therefore, it is of practical significance to study the developmental strategy of Henan leisure agriculture.

Quantitative method is widely used in development assessment and strategic decision. Among them principal component analysis and SWOT analysis are the common used methods. SWOT analysis is also known as situation analysis, where S represents strength, W represents weakness, O represents opportunity, T represents threat (Zavadskas, Turskis & Tamosaitiene, 2011; Reihaniana, Zalina, Kahromb & Hinc, 2012). SWOT analysis is very important as an approach for strategy analysis (Halla, 2007). However, it is mainly qualitative in traditional application, which lacks objective measure. Analytic hierarchy process (AHP) is a technique for organizing and analyzing complex decision in a quantitative way. It is helpful for comparative analysis by transforming quantitative data to qualitative data, which compensates for the deficiency of traditional SWOT analysis. It has important application value to combine SWOT and AHP (Shresthaa, Alavalapatia & Kalmbacher, 2004) in development assessment of Henan leisure agriculture.

## 2. Methods

SWOT-AHP joint method was used in the developmental strategy assessment of Henan leisure agriculture with a higher expected precision and accuracy. The basic procedures are as follows. Yaahp6.0 software was used in calculation:

1. The influential factors and indices were obtained by SWOT analysis;
2. Three-hierarchy model was constructed: objective layer, factor layer, index layer.
3. The single hierarchical arrangement (the sequence of about the weight of each factor in this layer) and overall arrangement were obtained.

The single hierarchical arrangement of the index layer relative to factor layer or of the factor layer relative to objective layer in terms of importance could be obtained via step 1-3. The total arrangement of all the indices relative to the objective layer could be obtained via step 4.

**Step 1.** The judgment matrix  $A$  was constructed;

$$A = (b_{ij})_{n \times n} = \begin{bmatrix} b_{11} & b_{12} & \dots & b_{1n} \\ b_{21} & b_{22} & \dots & b_{2n} \\ \dots & \dots & \dots & \dots \\ b_{n1} & b_{n2} & \dots & b_{nn} \end{bmatrix} \quad (1)$$

Where  $b_{ij}$  means the relative importance of  $b_i$  to  $b_j$  for the index of the last layer (1-9 scale).

**Step 2.** The single hierarchical arrangement was calculated.

- The matrix  $A$  was normalized by column (make the sum of the columns as 1):

$$w_{ij} = \frac{b_{ij}}{\sum_{i=1}^n b_{ij}} \quad (2)$$

- $w_{ij}$  was summed up by rows:

$$\overline{w}_i = \sum_{j=1}^n w_{ij} \quad (3)$$

- $\overline{w}_i$  was normalized:

$$w_i = \frac{\overline{w}_i}{\sum_{i=1}^n \overline{w}_i} \quad (4)$$

- The eigenvector was  $W$

$$W = [w_1 \dots w_n]^T \quad (5)$$

**Step 3.** Consistency check

- The maximal value of characteristic root  $\lambda_{\max}$  corresponding to  $W$  was calculated

$$\lambda_{\max} = \frac{1}{n} \sum_i \frac{(AW)_i}{w_i} = \frac{1}{n} \sum_{i=1}^n \frac{\sum_{j=1}^n b_{ij} w_j}{w_i} \quad (6)$$

- The consistency index  $C.I.$  was calculated.

$$C.I. = \frac{\lambda_{\max} - n}{n - 1} \quad (7)$$

- The consistency ratio  $C.R.$  was calculated.

$$C.R. = \frac{C.I.}{R.I.} \quad (8)$$

The value of  $R.I.$  could be obtained via look-up table. The consistency passed test when  $C.R.<0.1$ .

**Step 4.** The total hierarchical arrangement  $g_k$  was calculated.

$$g_k = \sum_{i=1}^n \beta_i \varepsilon_i \quad (9)$$

Where  $n$  represents the factor number of indices of criteria layer relative to index layer;  $\beta_i$  represents the weight of each element of criteria layer relative to the objective layer;  $\varepsilon_i$  represents the weight of each index of index layer relative to criteria layer.

4. The extent of total strength, total weakness, total opportunity and total threat was obtained according to weight.
5. The strategic decision quadrangle in SWOT was constructed;

$$P(x, y) = \left( \sum_{i=1}^4 x_i / 4, \sum_{i=1}^4 y_i / 4 \right) \quad (10)$$

The strategic focus was determined according to the formula.

### 3. Results and Analysis

#### 3.1. The SWOT analysis of the development of Henan leisure agriculture

##### **Strength**

###### *Superior location*

Henan province is located in the centre of China with superior position. Henan is located in north subtropical and warm temperate area, suitable for the development of agriculture, forestry, husbandry and fishery because of its warm weather, ample sunshine and abundant rainfall. Henan is one of the major grain-producing areas with vast plains and fertile soil.

###### *Abundant resources*

Grain crops are extensively planted in Henan province which has large area of arable land and developed economic forest. Henan is a traditional agricultural region in China with profound farming culture and folk culture resources, offering an abundance of cultural materials for the development of leisure agriculture.

### *Convenient transportation*

Henan has convenient traffic and obviously superior location, which connects the east and the west, the north and the south. Henan has integrated transport network consisting of railway, highway, aviation, water transportation and pipeline. The highway total mileage reached 244 thousand kilometers in Henan province by the end of 2010; and that of highway reached 5.016 kilometers, ranking the first for five consecutive years in China.

### *Abundant tourist population*

Henan province is the most populous province of China. Although a great pressure on resources, environment and economic development is caused by the large population, it could also be a huge customer source in the future development with the acceleration of urbanization and fast improvement in people's income level.

## **Weakness**

### *Weak economic base*

The tourist demand is closely relevant to people's income level. Agricultural population takes up a large proportion of the total population of Henan province for a long time. The development of Henan leisure agriculture is restricted by the low demand for tourism consumption caused by lower income level.

### *Low level of urbanization*

Metropolitan area with developed economy is the effective space carrier for the development of leisure agriculture. The experience of developed countries and areas shows that leisure agriculture needs to rely on large city. It is unfavorable for the development of Henan leisure agriculture due to its lower urbanization level, no super-large city and no urban population with high economic capacity.

### *Lower level of industrialization*

The tourism industry of Henan is more developed because of its rich tourism resources. The tourism industry at present mainly concentrates on development of cultural tourism, red tourism and natural scenic tourism. However, there is not yet a reasonable industrial pattern formed for leisure agriculture, which is with the problems of decentralized distribution and lower level of industrialization.

### *Incorrect market positioning*

A correct positioning of target market is the premise for healthy development of leisure agriculture. The development model for the overall Henan leisure agriculture has the problem

of lacking diversity. Currently the available services limit to sight-seeing, recreation, catering, picking and so on. China's tourism industry is under the transition from scenic tourism to leisure travel at the moment. It will be very difficult to realize the sustainable development of leisure agriculture if we fail to keep up with the changing of the tourism market.

## **Opportunity**

### *Orientation of tourism policy*

Agricultural tourism and experience-based tourism activities with distinctive characters are encouraged in the project of increasing the income of rural people through rural tourism. This point has been explicitly mentioned in "Some Opinions on the Acceleration of the Development of Tourism Industry issued by the State Council in 2009. It has been indicated in "Twelfth five-year" plan" for China's tourism industry that Chinese government will set up a special investment for intensive support for the construction of infrastructure facilities of key scenic spots, red tourism, rural tourism in central and western regions.

### *Implementation of leisure system*

China will enact the "Outline of National Tourism and Leisure" to improve the public awareness of tourism and leisure and to implement the paid leave system. Taking the opportunity of the release of "Outline", public welfare propaganda to promote tourism and leisure shall be vigorously implemented through the establishment of National Tourism Day and other measures. The purpose is to strengthen the tourism and leisure education, foster scientific view on leisure consumption, advocate healthy and civilized tourism and leisure behavior. By creating a social atmosphere conducive to tourism and leisure development, the consumption potential of tourism and leisure will be fully exploited. The increase of public leisure time would be good for the development of Henan leisure agriculture.

### *The building of central plains economic zone*

The urbanization level of Henan province will be promoted effectively by "Guidance on Support for Acceleration of the Building of Central Plains Economic Zone enacted by the State Council in 2011. It will provide good opportunities for the development of leisure agriculture to form open, competitive city clusters and to implement the strategy of "city leads rural areas" in Henan province.

### *Agricultural industry structure adjustment*

Henan province will become an important base for grain production and modern agriculture. High-yield, high-quality, high-efficiency, eco-friendly, safe agriculture shall be developed and the modern agriculture industrial system shall be fostered through the transformation of



agricultural production mode and the adjustment of agricultural industry structure. All of these offer policy support for the development of leisure agriculture.

### **Threat**

#### *Source reliability of capital*

Capital is an important guarantee for the development of leisure agriculture. Capital chain rupture would cause a great loss to leisure agricultural construction due to the slow return on investment in leisure agriculture.

#### *Suitability of technology*

The leisure agriculture park will be easily driven out of the market without the support of science and technology, which is a significant back-up for leisure agriculture industry development, especially for those focused on organic production.

#### *Advancement of management system*

Tourism management is an important guarantee for sustainable operation of tourism. The management of many parks, however, is almost disconnected with marketing and market at the moment. The primary reasons are: The ratio of staffs with professional knowledge background is very low, leading to a managerial and marketing team of low qualification. Managerial and marketing strategy could not be adjusted in time according to the feedback from the tourists and market due to the unprofessional managerial and marketing experience. Other reasons are capital shortage, focus on planning and construction but little attention to management and marketing.

#### *Ecology of the site environment*

Pollution-free products, green products and organic products are the featured products of leisure agriculture park. The soil is polluted by large use of pesticides, fertilizers and hormones in traditional agricultural production in Henan province. Some regions are troubled by serious heavy metal pollution, which would threaten the healthy development of leisure agriculture.

The SWOT diagram of Henan leisure agriculture was constructed according to the above discussion, where the strength and weakness were called internal factors, and opportunity and threat, external factors (Table 1).

Internal factors	Strength		Weakness	
	S <sub>1</sub>	Superior location	W1	Weak economic base
	S <sub>2</sub>	Abundant resources	W2	Low level of urbanization
	S <sub>3</sub>	Convenient transportation	W3	Lower level of industrialization
	S <sub>4</sub>	Abundant tourist population	W4	Incorrect market positioning
External factors	Opportunity		Threat	
	O <sub>1</sub>	Orientation of tourism policy	T1	Source reliability of capital
	O <sub>2</sub>	Implementation of leisure system	T2	Suitability of technology
	O <sub>3</sub>	The building of central plains economic zone	T3	Advancement of management system
	O <sub>4</sub>	Agricultural industry structure adjustment	T4	Ecology of the site environment

Table1. Diagram of SWOT analysis

### 3.2. The index factor, index weight and SWOT intensity were determined using AHP method

#### *The hierarchy structure model was constructed*

A three-hierarchy model including objective layer, factor layer and index layer was constructed according to the results of SWOT analysis. The factor layer consisted of four factors: strength, weakness, opportunity and threat. The index layer consisted of 15 indices (Table 2).

Objective layer	Factor layer	Index layer
SWOT analysis	Strength	Superior location
		Abundant resources
		Convenient transportation
		Abundant tourist population
	Weakness	Weak economic base
		Low level of urbanization
		Lower level of industrialization
		Incorrect market positioning
	Opportunity	Orientation of tourism policy
		Implementation of leisure system
		The building of central plains economic zone
		Agricultural industry structure adjustment
	Threat	Source reliability of capital
		Suitability of technology
		Advancement of management system
Ecology of the site environment		

Table2. Hierarchy model of the developmental assessment of Henan leisure agriculture

The single hierarchical arrangement and total arrangement were calculated via step 1-4. The results passes consistency test. The assessment result is shown in Table 3

Factor	Local weight	Rank	Index	C.R.	Local weight	Global weight	Rank
S	0.2849	2	S1	0.0361	0.1622	0.0462	9
			S2		0.4396	0.1252	3
			S3		0.3018	0.0860	4
			S4		0.0964	0.0275	12
W	0.1051	4	W1	0.0534	0.1063	0.0112	16
			W2		0.4252	0.0447	10
			W3		0.1358	0.0143	15
			W4		0.3327	0.0350	11
O	0.4457	1	O1	0.0304	0.1710	0.0762	5
			O2		0.3183	0.1419	2
			O3		0.3898	0.1737	1
			O4		0.1209	0.0539	8
T	0.1644	3	T1	0.0574	0.4044	0.0665	6
			T2		0.1388	0.0228	13
			T3		0.1167	0.0192	14
			T4		0.3400	0.0559	7

Table 3. Single hierarchical arrangement and total arrangement

We can see from the weight of factor layer that the opportunity O (0.4457) of the development of Henan leisure agriculture was greater than threat T (0.1644); the strength at this stage S (0.2849) was greater than weakness W (0.1052). Thus it was shown that there is more opportunity and obvious strength to develop leisure agriculture in Henan province. The total arrangement could be divided into three hierarchies: The first hierarchy (weight > 0.1): O3, O2, S2; The second hierarchy ( $0.05 \leq \text{weight} \leq 0.1$ ): S3, O1, T4, T1, O4; the third hierarchy (weight < 0.05): S1, W2, W4, S4, T2, T3, W3, W1.

### **Strategic position**

The intensity of total strength, total weakness, total opportunity and total threat was calculated according to the single hierarchical arrangement and total arrangement. Then the strategic decision quadrangle in SWOT was constructed (Figure 1). Four strategies corresponding to different cross combinations of internal and external factors in SWOT. They were respectively SO (growth-oriented strategy), ST (diversified business strategy), WO (reverse-type strategy), WT (defensive-type strategy).

$P=(0.0449, 0.0703)$  according to the calculation. The P point fell into the first quadrant. Therefore, the growth-oriented strategy which combined the external opportunities and its own advantages should be adopted in the development of Henan leisure agriculture. Henan leisure agriculture is faced with the development opportunities and has great market potential with the adjustment of national industrial policy, transformation of agricultural industry structure and the approval of construction of regional economic zone. Henan province shall grab the opportunity to greatly improve the infrastructures of the leisure agriculture development zones to provide material guarantee for leisure agriculture development. We should actively expand

the funding channel, set down the reasonable industrial planning layout, accurately identify the target market, and product products which can meet the demand of market of different levels. We should take the demand of market as orientation in the construction of parks, with building a distinctive characteristic as focal point. We should achieve the following: design with high standard, improve the managerial and operational level, adjust the project setup in time according to market information. Strengthen the investment management and marketing, build diversified channel of investment, guarantee the virtuous operation of capital. Improve the core competitiveness of leisure agriculture, actively participate in domestic and international competition, form a new ecotourism industry and provide a tourist destination of high quality for citizens. Improve agricultural production efficiency and the rural income level and make a greater contribution to the economic development of Henan province through leisure agriculture.

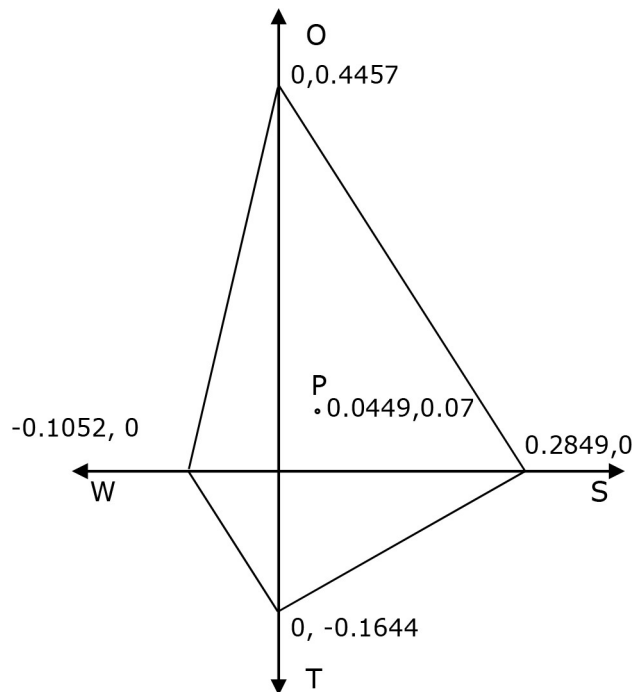


Figure 1. Strategic decision quadrangle

#### 4. Conclusion

The application of SWOT-AHP method in the development assessment of Henan leisure agriculture could quantify the evaluation result and make results more visual and reliable.

The opportunity of Henan leisure agriculture development is more than threat, and the strength outweighs weakness in this stage. It showed there are more opportunities and obvious advantages in the development of Henan tourism agriculture.

The growth-oriented strategy which combines the external opportunity with its own advantages should be implemented in the development of leisure agriculture.

## References

- Halla, F. (2007). A SWOT analysis of strategic urban development planning: The case of Dares Salaam city in Tanzania. *Habitat International*, 31(1), 130-142. <http://dx.doi.org/10.1016/j.habitatint.2006.08.001>
- Reihaniana, A., Mahmooda, N.Z.B., Kahromb, E., & Hinc T.W. (2012). Sustainable tourism development strategy by SWOT analysis: Boujagh National Park, Iran. *Tourism Management Perspectives*, 4, 223-228. <http://dx.doi.org/10.1016/j.tmp.2012.08.005>
- Sanagustín Fons, M.V., Moseñe Fierro, J.A., & Gómez y Patiño, M. (2011). Rural tourism: A sustainable alternative. *Applied Energy*, 88(2), 551-557. <http://dx.doi.org/10.1016/j.apenergy.2010.08.031>
- Shresthaa, R.K., Alavalapatia, J.R.R., & Kalmbacher, R.S. (2004). Exploring the potential for silvopasture adoption in south-central Florida: an application of SWOT-AHP method. *Agricultural Systems*, 81(3), 185-199. <http://dx.doi.org/10.1016/j.agsy.2003.09.004>
- Zavadskas, E.K., Turskis, Z., & Tamosaitiene, J. (2011). Selection of construction enterprises management strategy based on the SWOT and multi-criteria analysis. *Archives of Civil and Mechanical Engineering*, 11(4), 1063-1082. [http://dx.doi.org/10.1016/S1644-9665\(12\)60096-X](http://dx.doi.org/10.1016/S1644-9665(12)60096-X)
- Zhang, X.M. (2012). Research on the development strategies of rural tourism in Suzhou based on SWOT analysis. *Energy Procedia*, 16, part B, 1295-1299. <http://dx.doi.org/10.1016/j.egypro.2012.01.207>

Journal of Industrial Engineering and Management, 2013 (www.jiem.org)



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