Research on the selection of leading industries in agricultural characteristic towns in Rongchang district, Chongqing

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Abstract. Small towns with agricultural characteristics are an important entry point to promote the revitalization of rural industries. Establishing leading industries according to local development conditions is crucial to the healthy and sustainable development of agricultural towns. This paper evaluates and analyzes the choice of leading industries in Yuanjue Town, Rongchang District, Chongqing by constructing a hierarchical-principal component model, and draws conclusions. The rationality of the conclusion provides a reference for the selection of leading industries in agricultural characteristic towns in Sichuan and Chongqing.

Keywords: Agricultural characteristic town, leading industries, Hierarchical-principal component analysis.

1 Introduction

In recent years, the national policy system on the rural revitalization strategy and the No. 1 document of the Central Committee have mentioned the need to accelerate the construction of characteristic towns with deep integration of the first, second, and third industries [1]. The core element of the characteristic town lies in the support of the characteristic leading industry. Under the emerging "characteristic tide", how to establish the leading industry of agricultural characteristic towns in combination with the actual development of local industries has become particularly important. Based on the existing research on the selection of leading industries in agricultural characteristic towns, most of them are qualitative research from the subjective level and the theoretical level [2-8], based on this, this paper draws conclusions through empirical analysis of the hierarchical-principal component comprehensive evaluation model, and finally demonstrates the rationality of the conclusion from four levels: policy support, geographical environment, self-value and industrial association.

2 The basic situation

Rongchang District, located at the border of Chongqing and Sichuan, is an emerging strategic

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fulcrum of the Chengdu-Chongqing Twin Cities Economic Circle, and a state-level forest city, with a total of 5 characteristic towns in the area, of which Yuanjue Town belongs to the agricultural characteristic town.

Yuanjue Town is located in the westernmost part of Chongqing City, with a population of 13,973 people, located at the junction of two provinces and three districts and counties. It is an agricultural characteristic town with agriculture as the mainstay and secondary and tertiary industries as the supplement. With the development goal of "two towns and one base", namely: "characteristic town of health industry, pioneer town of integrated development of southern Sichuan and western Chongqing, and ecological raw material base of characteristic agricultural products", we will build "3 1,000 and 2 10,000" industrial bases around the characteristic industries of pepper, dairy cow, yuanbao maple, Chinese herbal medicine (honeysuckle) and Rongchang pig fattening.

3 Leading industry selection evaluation

3.1 Principles and methods

To establish the leading industry, we must first compare and analyze the overall development level and strength of the town's key industries. Different industries cannot be directly compared, so it is necessary to combine quantitative indicators to conduct comparative analysis of various industries, and to choose scientific and feasible methods and theories for the design and selection of quantitative indicators, we should pay attention to the following three points (1) Theory is linked to practice. (2) Pay attention to the quantifiability of evaluation indicators. The quantifiability of the indicators can ensure the authenticity of the data sources on the one hand, and the accuracy and scientificity of the analysis results on the other hand. (3) With the forward development of the domestic economy and changes in policies, the leading industries of the town are also achieving dynamic development.

In terms of evaluation methods, this paper adopts the hierarchical-principal component analysis method. The indicators are weighted by analytic hierarchy, then the sample data is standardized and weighted, and finally the comprehensive score of each industry is calculated by principal component analysis.

3.2 Construct an evaluation index system

By referring to "Research on The Industrial Selection of Interval Intuition Fuzzy Multi-attribute Characteristic Town Based on Improved DECENTEL and TOPSIS"[7]and "Zhangpu County Liuao Characteristic Town Leading Industry Selection and Development Strategy"[6] , this paper constructs the evaluation index system for the selection of leading industries in agricultural characteristic towns as shown in table 1.

3.3 Empirical analysis

In this paper, the seven major industries of Yuanjue Town are taken as the research object, and the comprehensive evaluation and scoring are carried out by the level-principal component analysis method, and the industry with the highest score is selected as the leading industry of the agricultural characteristic town. The author obtained actual local data by conducting field research on local governments, enterprises and farms, consulting the Rongchang Statistical Yearbook, the annual data of industrial development in the economic development sector, and conducting oral interviews with various enterprises.

Table 1. Evaluation index system.

Target layer	Level 1 indicators	Secondary indicators
Agricultural characteristic town leading industry choice	Development potential B_1	Sales growth rate C_1
		Demand incomeelasticity C_2
	Economic benefits B_2	Operating margin C3
		Employmentabsorptionrate C_4
	Technological levelB_3	Proportionofscientific and technological personnel C_5
		Intensityoftechnicalelements C_6
	sustainable development B_4	InvestmentInenvironmental resourcesprotection C_7
		Cost-to-expense ratio C_8
	Comparative advantage B_5	Location quotient C_9
		Comparelaborproductivity C_{10}

According to the hierarchical hierarchy established above, the two indicators in each layer are compared and scored in two pairs, in order to make the conclusion more referenced, the author consults two local experts and the local office director who focuses on industrial development, asks them to determine the relative importance of each indicator and gives the corresponding scale to score, and gets the judgment matrix A and B_1 B_2 B_3 B_4 B_5

$$A=\begin{bmatrix} 1 & 2 & 2 & 2 & 3 \\ 1/2 & 1 & 2 & 2 & 2 \\ 1/2 & 1/2 & 1 & 2 & 2 \\ 1/2 & 1/2 & 1/2 & 1 & 2 \\ 1/3 & 1/2 & 1/2 & 1/2 & 1 \end{bmatrix}, \text{ weight vector } \omega=\begin{bmatrix} 0.3395 \\ 0.2397 \\ 0.1842 \\ 0.1408 \\ 0.0957 \end{bmatrix}, \lambda_{\max}=5.1468, \mathrm{CI}=\frac{(\lambda-n)}{(n-1)}=0.0367,$$

look at the table to see $\mathrm{RI}=1.12$,according $\mathrm{CR}=\mathrm{CI}/\mathrm{RI}$,Calculated $\mathrm{CR}=0.0327$,tested $\mathrm{CR}<0.1$,Therefore, the judgment matrix passes the consistency test. The development potential judgment matrix $B_1=\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$,weight vector $\omega_{B_1}=\begin{bmatrix}0.5\\ 0.5\end{bmatrix}$ .the economic benefit judgment matrix $B_2=\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$,weight vector $\omega_{B_2}=\begin{bmatrix}0.5\\ 0.5\end{bmatrix}$.the technical level judgment matrix $B_3=\begin{bmatrix}1 & 2\\ 1/2 & 1\end{bmatrix}$,weight vector $\omega_{B_3}=\begin{bmatrix}0.667\\ 0.333\end{bmatrix}$ .the sustainability Judgment Matrix$B_4=\begin{bmatrix}1 & 1/2\\ 2 & 1\end{bmatrix}$,weight vector $\omega_{B_4}=\begin{bmatrix}0.333\\ 0.667\end{bmatrix}$.the comparative advantage judgment matrix $B_5=\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$,weight vector$\omega_{B_5}=\begin{bmatrix}0.5\\ 0.5\end{bmatrix}$.These five judgment matrices are all 2nd-order matrices and are always consistent. Therefore, there is no need for a conformance check. The total ranking of the weighted metrics obtained by calculating the eigenvalues and eigenvectors is shown in Table 2.

Next, the principal component analysis method was used to quantitatively analyze the six major industries, First of all, after the weight $\omega=(0.1695,0.1695,0.1195,0.1195,0.1227,0.0613,0.0466,0.0933,0.0475,0.0475^T$ obtained above is standardized and weighted on the sample data, the corresponding correlation coefficient matrix R is calculated, and its eigenvalues and principal component contribution rates are shown in Table 3, and it can be observed that the eigenvalues of the first three principal components are greater than 1 and the cumulative contribution rate has reached 88.789%, which can reflect the main information of the leading industry selection, so the first three are selected as the principal components.

Table 2. Weight distribution.

Target layer	Level 1 indicators	weight	Secondary indicators	weight	Combined weights
Agricultural characteristic town leading industry choice	B1	0.3394	C1	0.500	0.1695
			C2	0.500	0.1695
	B2	0.2397	C3	0.500	0.1195
			C4	0.500	0.1195
	B3	0.1842	C5	0.667	0.1227
			C6	0.333	0.0613
	B4	0.1409	C7	0.333	0.0466
			C8	0.667	0.0933
	B5	0.0958	C9	0.500	0.0475
			C10	0.500	0.0475

Table 3. Eigenvalues and contribution rates.

Element	Eigenvalues	Contribution rate(%)	Cumulative contribution rate(%)
1	3.36	33.604	33.604
2	3.092	30.917	64.522
3	2.427	24.267	88.789
4	0.813	8.129	96.918
5	0.269	2.691	99.609
6	0.039	0.391	100
7	0	0	100
8	0	0	100
9	0	0	100
10	0	0	100

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Then the eigenvectors corresponding to the eigenvalues of the correlation matrix can determine the index coefficients of each principal component, and the expression of the three principal components is obtained as follows:

$$Y_1 = 0.3780x_1 + 0.4294x_2 - 0.0378x_3 - 0.3264x_4 + 0.5134x_5 + 0.1936x_6 + 0.1063x_7 - 0.0232x_8 + 0.4338x_9 + 0.2520x_{10}$$

$$Y_2 = -0.1104x_1 - 0.3304x_2 + 0.1881x_3 - 0.2666x_4 - 0.1315x_5 + 0.4106x_6 + 0.5301x_7 + 0.1514x_8 - 0.1971x_9 + 0.4395_{10}$$

$$Y_3 = -0.1138x_1 - 0.1045x_2 + 0.5965x_3 - 0.0577x_4 + 0.1095x_5 - 0.3620x_6 - -0.1271x_7 + 0.6127x_8 + 0.2845x_9 + 0.0386x_{10}$$

Finally according to the formula $F = \sum_{g=1}^{k}\left(\lambda_g / \sum_{i=1}^{p}\lambda_i\right) Y_g$ Calculate the comprehensive evaluation scores of the seven major industries, as shown in Table 4.

Table 4. Comprehensive industrial score.

Industry name	Industry Score	Sort
Chili	-0.10	6
Honeysuckle	-0.02	5
Cows	0.02	3
Yuanbao-maple	0.12	1
Rongchang pig	0.09	2
Tangerine	0.00	4
Garment processing	-0.11	7

Through the above result analysis, it can be seen that the industrial score of YuanbaoFeng is 0.12, ranking first. The reason why the Yuanbao maple industry can rank first is as follows: First, from the perspective of national policies, our country is vigorously supporting the planting of Yuanbao maple trees and the development of the Yuanbao maple industry. Second, from the perspective of the geographical location and climatic characteristics of Rongchang District, Yuanbao Maple Tree is completely suitable for the ecological environment of Rongchang and grows well. Third, from the perspective of the value of Yuanbao Maple itself, Yuanbao Maple tree is a treasure all over the body, which is an efficient special economic plant integrating edible oil, protein, medical and health care, quercetin, chemical raw materials, honey source, scenery viewing, soil and water conservation and special wood, integrating ecology, economy and society. Fourth, from the perspective of industrial linkage, the Yuanbao maple industry can drive the healthy development of other industries in Yuanjue Town.

In summary, whether it is from the national policy level, the geographical environment of Rongchang District, its own value or industrial relevance, Yuanbaofeng industry is the best choice for the leading industry of agricultural characteristic towns.

4 Conclusion

According to the actual industrial development of Yuanjue Town, the comprehensive score of each industry was calculated by constructing a hierarchical-principal component analysis model, and the results showed that the industrial score of Yuanbaofeng ranked first, and then the rationality of Yuanbaofeng as the leading industry of the agricultural characteristic town was demonstrated from the four levels of policy support, geographical environment, self-value and industrial association, which provided a reference and reference for the selection of the leading industry of the agricultural characteristic town in Sichuan and Chongqing.

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