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Establishment of rural tourism and new rural construction coupling degree evaluation model based on the capacity coupling concept and capacity coupling coefficient model

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ABSTRACT

The value of capacity coupling coefficient model lies in that it can fully embody the relevance existing between different systems and degree of influence. And there is a close relationship and certain effect between rural tourism and new rural construction. In the process of the study, firstly, the establishment of index system has been discussed and studied, from which to determine the basic principles of index selection. At the same time, the process of building index system has been more scientifically selected, making the evaluation index more representative and strong scientific. After that specific selection process has been carried out aiming at index weight method in order to make the calculation way of index weight more clearly, and reflecting the specific interaction influence existed between rural tourism and new rural construction clearly. The last part is the research on the establishment of the rural tourism and new rural construction coupling degree evaluation model from three aspects such as the efficiency factor, coupling degree function and coupling coordination degree function, having laid a solid foundation for the scientific growing of model construction. This is the main idea of this subject, and the specific objective of the study can be also seen, and reflecting the main contents of the study. So the study has a strong science and rationality.

KEYWORDS

Capacity coupling coefficient model; Rural tourism; New rural construction; The coupling degree evaluation model.



INTRODUCTION

Rural tourism and new rural construction has inseparable relation, and also will produce a certain degree of mutual influence. Based on this aspect, the establishment of coupling degree evaluation model can calculate the mutual influence degree and the specific interaction coefficient effectively, in order to estimate the importance. The research process has been carried out mainly from two aspects liking the rural tourism and new rural construction of coupling degree evaluation index system and the rural tourism and new rural construction coupling degree evaluation model building, in order to fully reflect the value of coupling degree evaluation model.

RURAL TOURISM AND NEW RURAL CONSTRUCTION COUPLING EVALUATION INDEX SYSTEM

The basic principles of index selection

The representative principle

In the process of building the coupling system, the first is to understand the uncertainty of the system, and it will change with time, so in the process of index selection, the scope involving is much widely. However, from the perspective of index system, the scope of indicators should not too wide. In such circumstances, the index having strong representativeness, independence and comprehensive shall be selected effectively, thus making the accuracy of the coupling evaluation index.

The scientific principles

In the process of building coupling system of rural tourism and new rural construction, the connotation included should be effective mined in order to establish the corresponding evaluation index for the purpose of fully reflecting the importance of rural tourism development from an objective point of view. And in which the evaluation indicators need to involve the economic benefits, ecological environment and other aspects^[1]. Under this principle, the process of index selection should be more scientific, so as to fully guarantee the index data have an objective and fair significance for the rural tourism and new rural construction.

The principle of data availability

In the process of evaluation index selection and the establishment, its main purpose is to apply better, so in the design process of evaluation indexes, the data must has availability. The inherent requirement of this character lies in that the data needed by evaluation index shall be obtained effectively and able to conduct specific comparison in the process of index related calculation, and the data acquisition process must have the corresponding quantization function. However, in the process of rural tourism and new rural construction system building, a lot of index data cannot be easily obtained, so the substitution of some quantitative index shall be selected to give corresponding reaction for the basic development.

System principle

For each evaluation index, it is an important part of establish coupling evaluation system. The effective selection and optimization of each evaluation index in the evaluation system will closely combine with the system principle of index selection. And this can have stronger objective meaning for the design process of coupling evaluation system, reflecting the inner link between factors including economic benefit, ecological environment and rural tourism and new rural construction coupling development intuitively, making the evaluation objective and the whole evaluation system have unity.

The selection of index system

The establishment of index system

Starting from two levels including the scientific and representative of index system building, the index system construction methods mainly uses three methods including theoretical analysis, frequency statistics and literature retrieval for system selection and setting of coupling index. Firstly, to search CNKI database of nearly ten years for references on rural tourism and new rural construction, and thus carrying out the system construction of the index system. And in this process, the corresponding data analysis, statistics and assessment have been combined with to targeted select the representative evaluation index. After that the specific steps analysis has been conducted aiming at the theoretical analysis process, deeply exploring the concrete connotation, the basic feature and specific embodiment of modes of rural tourism and new rural construction development, so as to find the coupling degree evaluation index system suitable for study. Finally, the collected relevant indexes collected was conducted effective finishing processes, and was combined with the initial establishment of evaluation index system to carry out effective statistic data query on the evaluation index system through a variety of ways^[3]. However, in the process of consulting index, the evaluation index cannot be queried shall be adjusted according to the specific opinions of experts, finally obtaining the specific quantitative index system. Through detailed empirical analysis process, data standardization thoughts shall be combined with to carry on the effective operation of the related coefficient, and those repeated evaluation index shall be merged. According to the evaluation index selection method, in the process of study, the evaluation system of three layers of rural tourism and new rural construction has been established. As shown in TABLE 1.

TABLE 1 : Initial index system of rural tourism and new rural construction coupling system

System level	First class index	The secondary indexes
Rural tourism subsystem	Tourism management X1	Village committee(number)X11, tourism consulting service center (number) X12
	Tourism economic benefits X2	Total retail sales of catering industry, (million) X21, rural tourism revenue (million) X22, tourism revenue growth rate(%)X23, rural tourism reception population (million) X24
	Tourism landscape quality X3	Travel comfortable period (month) X31
	Tourist facilities X4	Tourism infrastructure construction fund X41, tourism supporting service facilities X42, tourism safety facilities X43
	Tourism environment X5	Nongjiale Tourism Village (spot) X51, Tourism personnel training (individual) X52
The new rural construction subsystem	Rural infrastructure (Y1)	The number of tap water villages (number) Y11, Auto village number (number) Y11, The phone number of village (number) Y13
	Economic development (Y2)	The per capita net income of rural households (Yuan) Y21, The total output value of agriculture forestry, animal Husbandry and fishery (current prices) (million yuan) Y22, the amount of the fixed assets investment in rural areas (million yuan) Y22
	Quality of life (Y3)	The Engel coefficient of rural residents (Y31), village electricity consumption (million kilowatt per hour) Y32, medical professional technical personnel number (individual) Y33, sickbed (number) Y34
	Social development (Y4)	The number of urban and rural residents to participate in medical insurance (million people) Y41, per hundred households holdings of durable consumer goods rural residents Y42, medical professional technical personnel number Y43, social welfare home number Y44
	Quality of population (Y5)	Natural population growth rate(%)Y51, family planning rate (%)Y52, sex ratio (male /female) Y53, rural employment number (million people) Y54
Resource environment (Y6)	Gross output value above per capita scale (yuan / individual) Y61, fiscal expenditure for the protection of the environment (million yuan) Y62, density of population (person/ square kilometers) Y63	

The determination of index order parameter up and low limit value

In the process of index order parameter determination, firstly, the realistic significance of rural tourism and new rural construction coupling model shall be fully established, and in which if the index numerical is bigger and has better effect, it can be concluded that the index has a positive role and the opposite has negative effect. Therefore, after the measurement of each indicator, the Engel coefficient of rural residents and the specific five relevant information indexes shall be determined effectively. And the coefficients of the five index order parameter are all positive, having positive nature. And the value of order parameter coefficient is divided according to concept, and the maximum value is upper limit, and on the contrary the minimum value is lower limit.

Selection of index weight method

The comparison of determine weight method

As for the selection weight methods, the process of study and exploration in the evaluation field mainly combine four kinds of methods including fuzzy clustering analysis method, Delphi method and entropy value method and hierarchical analysis to carry on. However, as for the process of using the four methods, Delphi method is the most commonly used and has larger scope of application in the weight selection, and it mainly proceeds according to knowledge of experts in many relevant areas and information, giving the concrete analysis and study of the determined evaluation index. And through the corresponding scrutiny and judgment process each evaluation index can have weight value suitable for the weight, thereby determining the index weight effectively. Analytic hierarchy process mainly effectively analyzes the inherent nature of decision making problems, making the internal relationship between the problems further clear and unfolding the mutual influence gradually. After that the corresponding models building has been conducted, laying a solid foundation for reducing the structural complexity in the solving process. The concept of entropy comes mainly from the thermodynamics, it is an important tool to measure the uncertainty of system state, however in the information theory, and the major measurement method of information disorder is entropy method. If the information entropy value measured is greater, the disorder degree of information itself is bigger, thus proving the small validity of information^[4]. However, fuzzy clustering analysis is one of the methods which has simple application process in the four methods, and the applicable scope is relatively single. The

fuzzy similarity data existing in the research object has been used to conduct classification process of important degree in the evaluation index group.

Weight determination method

In the analysis process of rural tourism and new rural construction coupling system index, the first is to collect the sample data effectively and use the entropy method to reduce the subjectivity of the index weight. In the process of this study, entropy method is used to establish rural tourism and new rural construction coupling system evaluation index. The concrete steps of entropy method are shown as follows.

In the process of calculation, the evaluation index weights value in I year under the j system is y_{ij} , the specific calculation formula is as follows:

$$Y_{ij} = X_{ij} / \sum_{j=1}^m X_{ij} (0 \leq Y_{ij} \leq 1) \tag{1}$$

Through the above formula, proportion matrix of the index data can be effectively established, the matrix is $Y = \{Y_{ij}\} m * n$.

In the process of information entropy calculation of I index, the following formula can be used to calculate effectively:

$$e_j = -K \sum_{j=1}^m Y_{ij} \times \ln(Y_{ij}) (K \text{ in the formula is constant, } K = 1 / \ln(m)) (0 \leq e_j \leq 1) \tag{2}$$

Entropy redundancy is represented by d_j , and equals to $1 - e_j$

The calculation of evaluation index weight

In the process of using entropy method to calculate each evaluation indexes, in fact, the value coefficient of evaluation index is calculated detail. And the higher value coefficient means greater importance of evaluation index, also reflecting the relatively greater importance of index for rural tourism and new rural construction coupling evaluation.

THE ESTABLISHMENT OF RURAL TOURISM AND NEW RURAL CONSTRUCTION COUPLING DEGREE EVALUATION MODEL

The so-called coupling degree is in essence reflecting the degree of interaction and mutual effect between the systems or in elements. However, from the angle of synergetic, coordination degree and coupling degree existing between the two systems are respectively on the two systems, and when it reaches the edge of the system, it can has important effect on the system building. However, the variables within the system reflected in the phase change is often slow and fast relaxation variable^[5]. While in the process of system disguised, the slow relaxation variable can play a decisive role, and it is also called the order parameter of the system. Each order parameter within the system can form mutual influence and effect, prompting system proceed from disorder mechanism to order mechanism, and this link is the key point of system reaching mutual coupling. And at the same time, this can also give full expression to deformation characteristics and existing laws of the system, reflecting the unit of measure of synergy effectively. And this is the coupling degree that often referred. So in the process of study, the rural tourism and new rural construction coupling degree can be defined as the degree of interaction and mutual influence between the rural tourism and new rural construction by their own coupling element. The number of coupling degree reflects the coordination development degree of the rural tourism and new rural construction.

The efficiency factor

Assuming that the variable $U_i (i = 1, 2, \dots, m)$, as the order parameter of the rural tourism and new rural construction coupling system, while the inner meaning of U_{ij} is the j index in the I order parameters, and its detail value is $X_{ij} (j = 1, 2, \dots, n)$. α_{ij}, β_{ij} are the upper and lower limit value of relatively stable order parameters between the coupling systems, Then the effect coefficient of the coupling system can be represented by U_{ij} , the concrete method of calculating is:

$$U_{ij} = \begin{cases} (X_{ij} - \beta_{ij}) / (\alpha_{ij} - \beta_{ij}) & U_{ij} \text{ has a positive effect} \\ (\alpha_{ij} - X_{ij}) / (\alpha_{ij} - \beta_{ij}) & U_{ij} \text{ has a negative effect} \end{cases} \tag{3}$$

In the formula above, the U_{ij} represents the contribution degree of X_{ij} variables function on the whole coupling system. However, as for the first formula in the front, efficacy coefficient should reflect the several characteristics. First, the

U_{ij} should reflect the satisfaction degree of each evaluation indexes reaching the target value, in which the value obtained is close to 1, then standing for higher satisfactory level. And U_{ij} is 0, standing for the most unsatisfactory. The normal range of U_{ij} should be less than or equal to 1 and greater than or equal to 0. However, from the perspective of the system building process having two interaction subsystems, the calculation process of its total contribution value has selected integrated calculation method to compute the parameters of each subsystem, thus acquiring the size of the total contribution value^[6]. However, in the process of calculation, the corresponding linear weighting method has been adopted by many people. And in the course of the study this method is also used for the specific calculation on the total limit, the formula is as follows:

$$U_i = \sum_{j=1}^m \lambda_{ij} U_{ij}, \quad \sum_{j=1}^m \lambda_{ij} = 1 \quad (4)$$

Represents In the above formula, U_{ij} represents the specific contribution value of the whole coupling system in each subsystem, while X_{ij} is the weights of evaluation indexes.

The coupling degree function

From the perspective of physics, the definitions of capacity coupling and coupling coefficient model are the coefficient model which can promote the development of each system. However, on the basis of such theory, the coupling degree model of the mutual influence and interaction in corresponding system has been obtained by effective derivation process. That is:

$$C_m = \{(u_1 \square u_2 \square \dots \square u_m) / [\Pi(u_i + u_j)]\}^{1/m} \quad (5)$$

In the above formula, the coupling function existing between rural tourism and new rural construction has been derived effectively. See the detail as follows.

$$C = \{(u_1 \square u_2) / [(u_1 + u_2)(u_1 + u_2)]\}^{1/2} \quad (6)$$

As can be seen from the derivation formula, the range of coupling degree value is usually within 0 and 1. However, when its value is 0, then proving the coupling degree between the two subsystems is smaller, and the internal relationship between the two subsystems is rarely existed. And there are no common in the development direction of the system^[7]. However, when the value is 1, then proving the coupling degree between the two subsystems is greater and meanwhile reaching a benign resonance coupling. The establishment of the system has been developed gradually to the ordered structure.

The coupling coordination degree function

As an important index to reflect the rural tourism and new rural construction coupling degree, coupling degree has play an important role on identifying the strength of rural tourism and new rural construction coupling effect and guiding, changing the coupled development order. However, in some cases it is difficult to reflect synergistic effect and the overall efficiency of the new rural construction and rural tourism development rate, especially in the comparison of various areas. In view of the dynamic and different and not synchronous characteristics of rural tourism development level and new rural construction rate in each area, and the up and low limit of order parameters are mostly minimum value and maximum value of some certain year in each area when we computing the coupling degree. Therefore, only relying on the coupling degree to make judgments will produce mistake. Therefore, the coordination degree model of the rural tourism development and new rural construction level has been established, in order to analyze the interactive coordination degree between rural tourism and new rural construction in different regions, its algorithm can be expressed as:

$$\begin{cases} D = \sqrt{C \times F} \\ F = aU_1 + bU_2 \end{cases} \quad (7)$$

CONCLUSION

The above is relevant study and discussion process aiming at the establishment of rural tourism and new rural construction coupling degree evaluation model based on the capacity coupling concept and capacity coupling coefficient model. The study of first part is taken as the foundation, and then extends to the establishment of the rural tourism and new rural construction evaluation model. Therefore, the above makes the research direction maintain a high degree of accuracy and pertinence, laying a solid foundation for the further development of the later research work.

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