Analysis of Rural Governance and Resource Endowment Modeling Based on Association Rule Algorithm

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Abstract

At present, in the modeling and analysis of rural resource endowment, the internal relationship of elements is ignored, resulting in inaccurate judgment of governance level. Therefore, the modeling and analysis of rural governance and construction resource endowment is based on association rule algorithm. Identify the characteristics of rural governance resource elements as the information basis, design the clustering algorithm to determine the association rules and element attributes, and use the association rules algorithm to mine the internal relationship of resource endowment. Taking the information of rural governance resource endowment as the direction, the evaluation index is selected, and the rural resource endowment measurement model is constructed. The experimental results show that the modeling analysis results based on association rule algorithm are consistent with the actual governance development orientation, while the modeling analysis results based on evolution analysis algorithm and special group analysis algorithm are quite

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different from the actual governance development orientation. Therefore, the modeling analysis in this paper is more accurate, which is conducive to the accurate implementation of governance policies and rural planning.

Keywords: Association rule algorithm, rural governance, resource endowment, modeling analysis, classified governance, factors of production.

1 Introduction

Rural resource endowment is currently being modelled and analysed without taking into account the interrelationships between aspects, resulting in an erroneous assessment of governance level. The countryside is a part of the human social system, together with the city to form an organic whole, relying on each other and indispensable. Under the wave of urbanization, rural decline has become a recognized global problem. Due to the shrinking population, rural system is facing the problems of labor shortage, economic recession and even social decline. Since the reform and opening up, agriculture and rural areas have made great contributions and sacrifices to China's industrialization and urbanization. At the same time, urban and rural areas are also moving towards prosperity and decline. The Chinese government has put forward the strategy of "rural revitalization". The new strategy is not only an upgraded version of the original policy in terms of its connotation and requirements. And from the overall goal of achieving comprehensive rural revitalization in 2050, we can see that the strategy focuses on the whole rural system. A rule-based algorithm is used to model and analyse rural government and construction resources. Consider rural governance resource elements as a data source and develop an algorithm to discover association rules and element attributes, then use the algorithm to determine resource endowment's internal relationships.

With the sustainable development of society, economy and technology and the interaction of various factors, China's rural areas have appeared diversity, increasing the difficulty of rural cognition and identification [1]. The rural resource endowment measuring approach is built using the rural governance resource endowment information as a guide. Modeling analysis based on association rule algorithm is consistent with actual governance development orientation

At present, there are about 585000 villages in China. How to manage the huge rural system efficiently and scientifically has become the key to realize the Rural Revitalization in an all-round way. Marsden, as a representative of

foreign scholars, has studied rural governance. For example, after analyzing the current situation of unbalanced rural development in 24 research sites in Europe, based on the different stages of development, the rural areas are divided into marginal type, productive type and comprehensive type. Then, based on the rural multi-function and the diversity of agricultural activities, the British countryside is divided into polymorphic agricultural type, non-agricultural type and sustainable type, in order to serve the different rural development direction and agricultural policy-making. Based on the rural evaluation, domestic scholars divide the coastal villages in eastern China into agriculture oriented, industry oriented, business travel service oriented and balanced development oriented, in order to serve the formulation of new rural construction measures. To sum up, rural governance is usually service-oriented, based on resource sharing and social economy, to determine the type of rural, select the classification index, which is both directional and realistic [2]. At present, the vast majority of funds for infrastructure construction of rural governance in China are still provided by local governments. In the case of limited funds, whether to choose balanced investment or unbalanced investment, how to invest in rural development scientifically and orderly has become a problem that the government must face. Therefore, it is necessary to build a resource endowment modeling analysis, establish a set of diagnostic system to evaluate the level of rural governance, in order to serve the orderly implementation of rural revitalization strategy. Whereas modelling analysis based on evolution analysis algorithm and special group algorithm is quite different from actual governance development orientation, according to the experimental results.

Based on this, based on the case database of rural demonstration village, data mining technology is used to mine the information of Rural Revitalization and development elements and element combination, which is the basis of rural governance and resource endowment modeling analysis. Association rule algorithm can analyze the internal relationship between parameters and indicators by mining the potential association rules between data, so it can analyze massive raw data, mine potential value information and guide decision-making [3]. Therefore, this paper studies the rural governance based on association rule algorithm, constructs the resource endowment modeling analysis, deepens the understanding of the law of rural development, and provides a scientific basis for the implementation of rural revitalization strategy. Hence the need for resource endowment modelling and a diagnostic system for evaluating the degree of rural governance in order to facilitate the implementation of rural revival strategies.

2 Analysis of Rural Governance and Resource Endowment Modeling Based on Association Rule Algorithm

2.1 Identify the Characteristics of Rural Governance Resources

Rural governance is a latecomer exogenous model. Affected by the national development strategy. It needs the state to mobilize political resources, social resources and market resources to invest in rural governance. As a latecomer to the game, rural government is an exogenous model. The national development strategy has an impact on this. To invest in rural governance, the state must mobilise political, social, and market resources. National mobilization is to achieve the fundamental goal of the country, gather and mobilize all kinds of resources [4]. Specifically speaking, on the one hand, it analyzes the relationship between national mobilization and political stability from the characterization of modernization, focusing on national social mobilization. On the other hand, from the perspective of national governance, national mobilization tends to be political mobilization. From the perspective of governance, mobilization means that political parties, governments and other political groups, in order to achieve a specific goal, mobilize all resources, use inducement, persuasion, coercion and other means to make the mobilization object accept its will [5]. However, national mobilisation tends to be a political mobilisation from the perspective of national government. To achieve a given goal, political parties, governments, and other political groupings mobilise all resources, utilise inducement, persuasion, coercion, and other measures to compel the mobilisation object accept their will. Rural economic structure is endogenous in its social resource endowment structure, and sustainable development needs the upgrading of resource endowment structure. The upgrading of social resource endowment structure is the key to promoting rural development strategy, and the upgrading of resource endowment structure relies on the national mobilization of all kinds of resources to achieve technological innovation, social system innovation, and public infrastructure construction innovation [6]. From the perspective of political resource mobilization, in order to accomplish a certain task, the state needs to adopt economic and political incentive measures, enlarge the effect of incentive structure, and mobilize the enthusiasm of grassroots leading cadres. In rural construction, the state increases the proportion of rural social capital investment through macro policy adjustment, while various functional departments and institutions actively respond to the national strategy to set up corresponding docking departments. On the one hand, rural development needs policy support. As a means of government governance, social policy

can meet human needs, enhance social welfare and promote social equity through redistribution system. In the process of rural revitalization, the government formulates policies based on the principle of "bottom line fairness", emphasizes the protection of inclusive, fair and basic rights, eliminates social exclusion, promotes social integration, and establishes an accounting system to evaluate social development [7]. On the other hand, rural governance needs the supply of public goods. Rural infrastructure and public services run through the whole process of rural revitalization, which is the focus of rural modernization. The construction of social resources mainly refers to the process of mobilizing the main body to form a strong cohesion through persuasion or pressure, and guiding social members to actively participate in major social affairs. In the construction of rural revitalization, the government mobilizes enterprises, institutions, administrative units, social organizations, etc. to give docking assistance to rural areas in terms of manpower, material resources, capital, technology, etc. [8]. From the perspective of market resources construction, the state helps the modern market to improve the new organization and encourages market resources to enter the countryside through system construction and economic incentive measures. And by giving preferential tax, financial support and other aspects to promote rural development. At the same time, the country also continues to improve the rural market mechanism to actively dock with modern market resources and promote the further prosperity of rural areas. In addition to the above-mentioned exogenous resources of rural construction, rural governance also needs to rely on endogenous resources [9]. Rural revitalization construction should pay attention to the "local situation" of rural endogenous resources, such as natural endowment, social environment, cultural environment, etc. Rural Endogenous resources mainly include rural physical and geographical environment, social and cultural environment and human psychological resources [10]. Rural Endogenous resources put rural agricultural production, public goods supply and ecological construction into rural governance and development, thus condensing rural publicity and community.

2.2 Design Rural Governance Resource Endowment Clustering Algorithm

Clustering is the basis of association rules algorithm used in association rules. The clustering effect will directly affect the rationality of interval segmentation of each data set, and also has a significant impact on the effectiveness of association analysis. Therefore, when clustering data, not only for one or

a pair of attributes, but also for the clustering algorithm, according to all the attributes of the data object clustering, and according to the clustering results to form interval partition or clustering. Clustering feature is used to describe the information collection of object sub clustering, and includes the cluster information projected to other attribute sets. According to the consistency evaluation results of clustering features projected to other attribute sets, interval partition rules can be determined. In order to establish quantitative association rules, the following restrictions must be met: first, the distance between the front and back of the rule cluster is not greater than the preset threshold. Secondly, in order to ensure that all clusters in the antecedent and all clusters in the consequent of an association rule appear at the same time, the distance between clusters is not greater than the preset parameter [11]. Clustering all attributes of data, clustering all attributes, makes the clustering results more fully reflect the relationship between metadata. In cluster analysis, tuples are high-attribute clusters with similarity. Because the attributes of all data clusters have the characteristics of clustering, each group of data in the data cluster contains attributes, so the formation of attribute clusters on each attribute will inevitably occur at the same time. In other words, if the number of tuples in the data set meets the minimum support in advance, then the cluster formed by all attribute clusters becomes the largest itemset of the data cluster. The smaller the distance between two data clusters, the stronger the association strength of the two data clusters. On the contrary, when the distance between data clusters is larger, the association strength of two data clusters is weaker [12]. The degree of association between two data clusters can be measured by the distance between projection clusters. The specific formula is as follows:

$$d = |o_1 - o_2| \tag{1}$$

In formula (1), o_1, o_2 represent the data cluster center of two projection clusters; d is the distance between two projection clusters. Data cluster center can be expressed as:

$$o = \frac{\sum_1^n b(\lambda)}{n} \tag{2}$$

In formula (2), o represents the data cluster center; n is the number of data; b represents data cluster; λ represents an attribute. The correlation strength is related to the preset parameter values. In order to clearly express the corresponding relationship between data clusters, the concept of clustering radius is introduced. That is, using the intersection tuples of the pre and post rule attribute intervals, the radius value of the projection clustering

on the intersection surface is taken as the reference value of the association degree, and expressed by percentage. In this way, parameter values are easier to understand and accept. Generally speaking, the association degree should be more than 50%, otherwise the mining value of association rules is not high, so the distance value of clustering center can be used as a reference value to meet the requirement of 50% association degree of rules, so as to improve the scientificity of parameter setting. Find the cluster group which is less than the distance parameter, and these cluster groups are the maximum frequent bit set, so we can use the idea of association rule algorithm to generate rules to generate sub rule set [13]. Through the generation of this rule, we can mine the association rules of rural governance resource endowment attribute data.

2.3 Mining the Intrinsic Relationship of Resource Endowment Based on Association Rule Algorithm

Based on the above characteristics of rural governance resources, the paper uses data mining to identify the information of rural governance resource endowment, and uses association rule algorithm to explore the internal relationship of resource endowment. The essence of rural governance is to realize the modernization of agricultural countryside. However, the development path and strategy choice of different rural areas are different in this process. Different resource sharing and endowment determine the different development path of villages. It is the logical starting point and basic premise to effectively realize rural revitalization to classify villages on the basis of heterogeneous resource sharing. Association rule algorithm, mainly through structured mathematical model, objectively reflects the internal relevance between a large number of data [14]. Because of the characteristics of big data in many aspects, such as mass, high dimension, heterogeneity, dynamic, spatiotemporal, diversity, multi-source, multi-scale and fuzzy. This makes the internal relevance between data very hidden, which requires the association rules algorithm to dig its potential value and internal relevance. According to the analysis of the model of rural governance and resource endowment, the latter part of the association rules to be explored is limited, and the elements of rural governance with resource endowment level are needed to be selected. This leads to a mining problem of association rules with constraints on the latter part. Association rules can be extracted by introducing appropriate constraints. The number of rules is reduced and the browsing of users is convenient. Constraint condition effectively guides the direction of mining by using domain knowledge, which makes the disadvantages of the lack of

user participation in the original mining system be reduced, making the whole mining process more purposeful, and the efficiency of the algorithm has also been greatly improved, and more practical association rules can be found. Social resource endowment structure is critical in supporting strategies for rural development, and the mobilisation of national resources for technical innovation, social system innovation, and public infrastructure innovation is required to accomplish this. Assuming that the attribute of rural governance level may be $W_1, W_2, \ldots, W_n$, then the frequent item set generated by association rule mining must contain $W_1 \cup W_2 \cup \cdots \cup W_n$. Therefore, this paper applies this idea to the two processes of Apriori algorithm to generate frequent sets and association rules, and transforms the problem of association rules into the following two points: (1) using all the resource endowment level items in the data items as constraints, find the frequent item set containing set $W_1 \cup W_2 \cup \cdots \cup W_n$. (2) According to the minimum confidence threshold, the frequent itemsets generated in the previous step are calculated, and the association rules of the latter containing the set $W_1 \cup W_2 \cup \cdots \cup W_n$ are generated. In the first point, this paper uses constraints to reduce the number of frequent item sets, filters out the item sets unrelated to the research objectives, and also achieves the purpose of reducing the number of scan transaction databases by Apriori algorithm [16]. In the process of generating association rules at the second point, the rules that do not meet the requirements can be filtered out by using post constraint. The database is compressed and stored by matrix. The support degree of candidate set is obtained by the operation between matrix column vectors, so as to reduce the number of candidate sets and further improve the mining efficiency. It is important to execute the same calculation for the subsequent clustering matrix and accumulate the support frequency if it is less than the minimum support threshold, otherwise it is simply put into the support matrix. The vectors for each frequent item set can be expressed as:

$$A = [a_1, a_1, \ldots, a_m]^T \tag{3}$$

In formula (3), A represents the vector of frequent itemsets; a is the vector element, with values of 0 and 1; m is the number of elements; T is the transposition matrix. Then the support frequency of the frequent itemset can be expressed as:

$$s = \sum_{1}^{m} a_m \tag{4}$$

In formula (4), s indicates the support frequency of the phase set. The corresponding column vectors in the confidence matrix are summed after

logical and operation, and the support frequency of each candidate item set is calculated. In this process, for each candidate set, we need to consider the clustering matrix less than k. If the calculated support is less than the given minimum support threshold, it is necessary to do the same calculation for the subsequent clustering matrix and accumulate the support frequency, otherwise it is directly put into the support matrix. Association rule algorithm is used to mine the internal relationship of rural governance resource endowment, and identify the elements and element combination information needed by rural governance. A support frequency for each candidate item set is calculated by adding the column vectors in the confidence matrix.

2.4 Building the Measurement Model of Rural Resources Endowment

Taking the information of rural governance resource endowment as the direction, the evaluation index is selected, and the rural resource endowment measurement model is constructed. In order to ensure the scientificity and rationality of the later research, this chapter needs to consider the following aspects when constructing the index system. When designing the index system, this chapter must examine the following criteria in order to assure the scientificity and logic of future research.

In the vast rural areas of China, with the development of rural reform and labor market, and the improvement of agricultural mechanization level, a large number of rural residents are separated from agricultural labor and go to cities to work. There are obvious changes in employment, income and social relations [17]. The resource endowment of farmers is diversified, including economic, land, information and social aspects [18]. Therefore, in the design of the resource endowment index system, it should be widely and comprehensively considered. On the basis of ensuring that the indicator system can reflect the resource endowments of different angles and aspects, we should also pay attention to the hierarchy of indicators [19]. The purpose is to reflect the actual situation of rural resource endowment from different levels, and ensure that it can be observed and measured directly. As a result, rural resource endowment can be viewed and assessed immediately. The indicators under the same dimension should reflect the resource endowment of farmers from different perspectives, and try to be representative. Indicators under different dimensions should be relatively independent to avoid cross or overlap between indicators and ensure the reliability of later empirical analysis [20, 21]. After constructing the index system, it is necessary to give weight

to the index. The commonly used subjective weighting method and grey system evaluation method have the defects of artificial subjective weighting. The comprehensive evaluation rule of entropy has the defect of average evaluation weight. Normalization of the sample evaluation index set is the first step in the modelling process of the resource endowment measurement model. Therefore, a resource endowment measurement model is designed, and the projection eigenvalues are used for comprehensive evaluation, so as to realize the projection pursuit and measurement, so as to improve the robustness and accuracy of the output results of the model. Following the following formula normalises each index value's extreme value in order to remove the dimension of each index value and unify its fluctuation range. The modeling process of resource endowment measurement model is as follows: (1) normalization of sample evaluation index set. In order to eliminate the dimension of each index value and unify the variation range of each index value, the following formula is used to normalize the extreme value.

$$\begin{cases} x = \dfrac{x^* - x_{min}}{x_{max} - x_{min}} \\ y = \dfrac{y_{max} - y^*}{y_{max} - y_{min}} \end{cases} \tag{5}$$

In formula (5), x represents the eigenvalue sequence of positive contribution index; y is the sequence of eigenvalues of negative contribution index; x^* is positive contribution index; y^* is the index of negative and positive contribution; $x_{\min}, x_{\max}$ are the minimum and maximum value of positive contribution index; $y_{\min}, y_{\max}$ are the minimum and maximum of negative contribution index. (2) The projection objective function is constructed. The constructed eigenvalue sequence of contribution index is projected with an angle to obtain the one-dimensional projection value of the sample in this direction. Using the eigenvalue sequence of the contribution index, the one-dimensional projection value of the sample in this direction is calculated. When optimizing the one-dimensional projection value, it is required that the projection value should reflect the dispersion characteristics of small concentration (each projection point should be concentrated locally to form a point cluster) and large dispersion (each projection point cluster should be dispersed as much as possible). Therefore, the projection objective function is constructed with the following formula:

$$f(\theta) = \mu(\theta)\rho(\theta) \tag{6}$$

In formula (6), $f(\theta)$ represents the projection objective function; θ is the projection angle; $\mu(\theta)$ is the standard deviation of projection value; $\rho(\theta)$ is the local density of the projection value. (3) Projection objective function optimization. When the sample set of each index value is given, the projection index function only changes with the change of projection direction. Different projection directions project different data structure features. The best projection method is to expose the projection direction of a certain feature structure of high-dimensional data as much as possible. Therefore, the best projection direction can be estimated by solving the problem of maximizing the projection index function. This is a complex nonlinear optimization problem with projection direction as optimization variable, which is difficult to deal with by traditional optimization methods. High dimensional global optimization can be achieved by using quantum genetic algorithm, and the best projection direction can be obtained through the maximum fitness function value. The flow of quantum genetic algorithm in this paper is mainly realized by MATLAB programming. (4) Calculate the evaluation results. The best projection direction vector is substituted into the projection objective function to obtain the projection values of each sample point, that is, the modeling and analysis results of the rural resource endowment measurement model. So far, the analysis of rural governance and resource endowment modeling based on association rule algorithm is completed. Consequently, the county has a good research typicality and the market demand base of Rural Revitalization and Governance. This classification method is built on the basis of four endogenous elements

3 Experiment

3.1 Experimental Preparation

The county is China's major ceramics production and export base. Despite the dominance of the ceramic industry, the county's economy is now dominated by industry and service, as opposed to agriculture. In this paper, based on the association rule algorithm, the rural governance and construction resource endowment are modeled and analyzed. In order to evaluate the application effect of the model, the following experimental verification is carried out. Taking a county in the east coast of China as the research object, considering the differences of resources, location and industry, 12 typical villages with strong rural characteristics are selected to ensure the diversity of cases. The county is the largest production and export base of craft ceramics in China.

Under the guidance of the ceramic industry, the county's economy is driven by industry and service industry, which is transformed from agriculture led to industry and service led. According to incomplete statistics, in 2020, there will be about 2300 factories in the county, and the other 15 township industries are still dominated by traditional agriculture, with relatively backward economic level. The overall economic development is good, but the development of urban and rural areas is extremely unbalanced. Although figures are not comprehensive, it is estimated that the county will have about 2300 factories by 2020, while the other 15 township industries are still dominated by traditional agriculture, with a relatively low economic level. Though the country's overall economic growth has been positive, the development of urban and rural areas has been wildly imbalanced in comparison. The Engel coefficient and urbanization level of the county are 37.2% and 72.6% respectively, which are in the range of good market demand environment. Therefore, the county has the market demand basis of Rural Revitalization and governance, and has good research typicality. Based on the four endogenous factors, a four-dimensional classification system is constructed, which divides the livelihood resources into superior and ordinary levels, the industrial foundation into strong and weak levels, the regional transportation into advantages and disadvantages levels, and the cultural/ecological environment elements into high, medium and low levels. Combined with the above evaluation system, the evaluation index of endogenous resource elements is calculated, and the results are shown in Table 1. To classify the livelihood resources, industrial foundation, regional transportation, and cultural and ecological environment aspects, a four-dimensional classification method is built based on these four endogenous factors.

According to the above-mentioned resource elements evaluation results, the model constructed in this paper is used to judge the rural governance level in the research area. It is necessary to insert the best projection direction vector into the projection goal function in order to acquire the projection values of each sample point, that is, the modelling and analysis findings of the rural resource endowment assessment model.

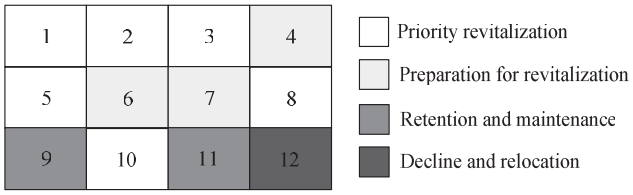
Table 1 Evaluation index of resource elements

Endogenous Resource Elements	Result	Threshold
Livelihood resources	[0.06, 0.57], [0.72, 1.58]	0.6
Basic industrial resources	[0.03, 0.28], [0.96, 2.11]	0.9
Regional transportation resources	[0.24, 0.71], [0.92, 1.75]	0.8
Cultural/ecological environment resources	[0.22, 0.36], [0.74, 0.79], [0.98, 1.81]	0.4, 0.9

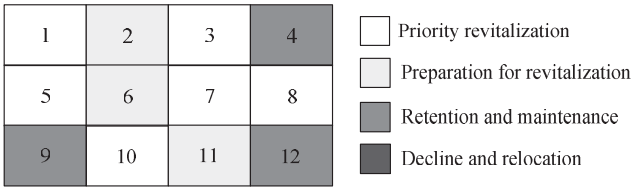
3.2 Experimental Result

In order to evaluate the effectiveness of the model, the model designed as the experimental group, the resource endowment model based on evolutionary analysis algorithm and specific group analysis algorithm was selected as the control group to carry out the comparative experiment. The above three models are used to model and analyze the governance level of the research area. The experimental results are shown in Figure 1. It is based on these evaluation results that this paper's approach is utilised to assess rural government in this area.

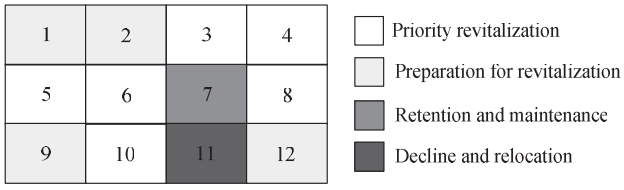
This paper's results on discrimination and positioning are compatible with the village's actual governance and development posture, suggesting that the results of this paper's resource endowment modelling study are more reliable. According to the experimental results in Figure 1, the model based



(a) Model based on association rule algorithm



(b) Model based on evolutionary analysis algorithm



(c) Model based on special group analysis algorithm

Figure 1 Governance level of study area.

on association rule algorithm can effectively judge the governance level of the village. Among them, the villages with serial numbers of 1, 2, 3, 5, 8 and 10 are priority revitalization type, the villages with serial numbers of 4, 6 and 7 are preparation revitalization type, the villages with serial numbers of 9 and 11 are retention maintenance type, and the villages with serial numbers of 12 are decline relocation type. The above discrimination and positioning results are consistent with the actual governance and development positioning of the village, indicating that the results of resource endowment modeling analysis in this paper are more accurate. This paper's models are therefore more dependable, which helps to properly quantify the degree of rural resource endowment, so that governance policies and rural planning may be implemented with greater precision. The modeling results based on evolution analysis algorithm and special group analysis algorithm are quite different from the actual development orientation of rural governance, which cannot provide reliable decision support for rural governance. Therefore, the modeling results of this paper are more reliable, which is helpful to accurately measure the level of rural resource endowment, so as to accurately implement governance policies and rural planning. This work builds a rural governance resource endowment model based on the association rule algorithm. Experiments have shown that the model's output may accurately reflect rural governance's actual development orientation, and that it has a considerable practical utility.

4 Conclusion

Based on the association rule algorithm, this paper constructs a rural governance resource endowment model. The experimental results show that the output of the model can truly reflect the actual development orientation of rural governance, and has a certain practical value. The "factor-combination" analysis not only comprehensively evaluates the natural environment, social economy and other endogenous factors needed by rural development, but also provides the basis for the next step of guiding rural development mode, which is practical. However, there are still deficiencies in this study. The selected villages in this paper can well reflect the situation of the eastern coastal areas. However, due to the consideration of time and space, there is no analysis of different provinces. Therefore, we should pay attention to the comparison of rural governance conditions and resource endowment between different provinces. Nevertheless, this study has some flaws. The selected settlements in this report are a good representation of the situation in the

eastern coastal regions. We were constrained in our analysis due to time and space constraints. It's important to compare rural governance and resource endowment among provinces.

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Biography

Wang Kaibing, male, Han nationality, was born in 1974, Yushe County, Jinzhong City, Shanxi Province, postgraduate, master, senior psychological consultant.title: Associate Professor, research direction: physical training educational science and police sports.

Participated in 2000 and has been working in physical training educational science and police sports. Now working in the Police Sports Department of Shanxi Police College, professional and technical police supervisor, an academic leader of the college, is hired as an instructor professor by many units in China.

Received many awards of Shanxi Public Security Department and Shanxi Police college, won the Excellent Individual of Ministry of Public Security, Excellent Correspondent of Public Security Education, Excellent Police Practical Skills Instructor in Shanxi Province, Excellent Teacher and Excellent Research Worker of Shanxi Police college, and won the Special Contribution Award of Shanxi Police college.

Participate preside over 8 the provincial and ministerial projects, participated in the compilation of 1 national planning textbook for general higher education, 7 textbooks of other categories, and published more than 40 papers and 3 invention patents.