

Research and Analysis of New Urbanized Rural Development Based on the Context of Big Data Development

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Abstract. The two strategies of rural revitalisation and new urbanisation have a symbiotic relationship of mutual promotion and mutual penetration. In view of this, this paper, on the basis of the evaluation index system of the relevant literature of scholars such as Yu Yunfeng and Lei Na, takes into full consideration the connotation and ultimate goal of the two strategies of rural revitalisation and new urbanisation and constructs the evaluation index system of rural revitalisation and new urbanisation in accordance with this. Principles for the construction of the indicator system: the principle of scientificity - the selection of indicators should be in accordance with the objective laws of economic development and the actual development situation of the region, and based on the principle of scientificity, to ensure that the selection of indicators can truly reflect the characteristics and situation of urban and rural development. Systematic principle - The selection of indicators should focus on the logic between indicators, closely link independent indicators, and accurately present the intrinsic connection between the two systems of rural revitalisation and new urbanisation. Typicality principle, availability - the accuracy of the original data is the key to constructing a comprehensive evaluation index system, at the same time, there are certain differences in the calibre of the data statistics of various regions, therefore, the selection of each indicator should take into account the availability of the original data as well as the operability.

Keywords: Big data; rural development; agricultural optimization; Rural revitalization

1 Introduction

New urbanization organically combines industrial development and town construction, takes the urban-rural interface as the entry point, develops characteristic towns and central villages and towns, builds an effective spatial carrier for the free flow of urban and rural elements, and guides the development of rural industries, promotes the integration of primary, secondary and tertiary industries, and stimulates the development vitality

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of the countryside by attracting the urban and rural capital, talents, culture, ecology and other resource elements to gather, exchange and integrate in the area [1]. Strengthening the synergy between urbanization and rural revitalization can give a strong impetus to agricultural modernization. Strengthening the synergy between urbanization and rural revitalization can help break the dual structure between urban and rural areas. Through the unified planning of towns and villages, it is possible to reconstruct the equal spatial structure of urban and rural areas and the complementary chain of urban and rural industries, realise the interconnection of infrastructures, the equalisation of public services, the co-construction of ecological environments and the promotion of the integrated development of urban and rural areas [2].

2 Construction of Evaluation Indicator System for Rural Revitalization and New Urbanization in a Regional Province

2.1 The Construction of Indicator System for Rural Revitalization and New Urbanization

Based on the principles of indicator selection and taking into account the situation of a certain regional province and the availability of data, this paper finally constructs a new urbanization evaluation index system from four levels: population urbanization, economic urbanization, social urbanization, and ecological urbanization; and a rural revitalization evaluation index system from four levels: rural industrial development, rural ecological environment, rural social development, and rural living standards; the details are as follows:

2.1.1. New Urbanization Indicator System.

The ultimate goal of implementing the new urbanization strategy is to solve the problem of irrational distribution of regional urban and rural population as well as the problem of quality of urban development, therefore, this paper sets population urbanization, economic urbanization, social urbanization, ecological urbanization as four secondary indicators, and at the same time selects the urbanization rate of the resident population, the natural growth rate of the population, the registered unemployment rate of the urban, the density of the urban population, and the per capita area of the city road and other five indicators to measure the urbanization of the population [3].

2.1.2. classical recall layer model.

(1) collaborative filtering algorithm family

Collaborative filtering algorithms are recognized as the most classical recommendation algorithms in the field of recommender systems, which can be traced back to the Xerox Research Center's email screening system in 1992 [4]. According to the recommendation principle can be divided into two categories: user-based and item-based. Collaborative filtering relies entirely on the behavioral relationships between users and items for recommendation, and its idea can be summarized as "things are grouped together, people are grouped together". The principle of item-based collaborative filtering recommendation is "clustering", i.e., recommending the most similar items to the user that the user has generated behavior. The preference sim(u, v) of user u for an item v can be expressed as:

$$sim(u, v) = \sum_{v_i \in V} score(u, v_i) \times sim(v_i, v)$$
(1)

Where V is the set of items for which the user has generated behaviour, $score(u, v_i)$ is the degree of preference of user u for item v_i and $sim(v_i, v)$ is the degree of similarity of item v_i to item v.

User-based collaborative filtering recommendation principle is "people to group", that is, with the user most similar to the user's favorite items recommended to the user, user u on an item v preferences sim(u, v) is expressed as:

$$sim(u, v) = \sum_{u_i \in U} score(u, u_i) \times sim(u_i, v)$$
⁽²⁾

Where U is the set of similar users of user u, $score(u, u_i)$ is the degree of similarity between user u and user u_i , and $score(u, v_i)$ has the same meaning as in Eq. 1.

The above two equations need to calculate the similarity between users or items, in the co-occurrence matrix users and items are embodied in the form of row vectors and column vectors, respectively, and the cosine similarity method of Eq. 3 can be used to calculate the similarity between the vectors:

$$sim(i,j) = cos(i,j) = \frac{i \cdot j}{||i|| \cdot ||j||}$$
 (3)

Collaborative filtering is simple, intuitive and interpretable, but weak in generalization [5]. Popular items are easily associated with and thus similar to a large number of items due to the large number of ratings, leading to a pronounced head effect, while long-tail items with few ratings and sparse vectors are difficult to be associated with other items, resulting in few recommendations.

The matrix decomposition algorithm generates a hermit vector for each user and item so that the user and item can characterize the similarity in the space of hermit vectors with the same dimensionality, which is essentially a decomposition of the co-occurrence matrix into the form of a product of hermit vectors. Hidden vectors are denser, thus enhancing the ability to handle sparse matrices.

3 Data sources

This paper selects the indicators of rural revitalization and new urbanization in two cities and six states of a certain regional province from 2011 to 2020 to carry out the empirical analysis, and the raw data are mainly obtained from the Statistical Yearbook of a certain regional province, the Statistical Yearbook of Municipalities and States, the Annual Statistical Bulletin of Municipalities and States, as well as the relevant government departments. Part of the data not directly labeled in the statistical yearbook, it is calculated by the relevant formula, at the same time, part of the missing data in this paper to take the interpolation method as a supplement [6].

4 Data processing

4.1 Standardized processing

The two systems of rural revitalization and new urbanization in this paper consist of 34 specific indicators, and the unit of measurement of each indicator is different, so in order to make the indicators comparable, it is necessary to carry out dimensionless processing. In this paper, the raw data were processed using the method of polarity standardization. The formula is as follows:

Positive indicators:Xij' = (Xij - minXij)/(maxXij - minXij)Contrarian indicator: Xij' = (maxXij - Xij)/(maxXij - minXij)

4.2 Determination of weights

Commonly used methods for determining weights include subjective and objective weighting methods, each of which has its own advantages and disadvantages. Among them, the subjective assignment method is based on the degree of importance of the indicators to the assignment, the principle is more in line with the essential requirements of the weight, but the reasonableness of its assignment is often subject to subjective cognitive influence is more likely to cause calculation errors, this paper adopts the entropy value method to determine the weight of the indicators in the comprehensive evaluation index system. The calculation steps are as follows:

Calculate the weight of indicator *j* in year *i*:*uij* = $Xij / \sum_{i=1}^{m} Xij$ Calculate the entropy value of each indicator using $uij:\lambda i = -\frac{1}{\ln(m)} \sum_{i=1}^{m} uijLn(uij)$ Reverse the entropy value: $\rho j = 1 - \lambda i$ The weights of the indicators *Xij* are calculated using $\rho i:\omega j = \frac{\rho j}{\sum_{j=1}^{n} \rho j}$ Using the weights ωj to calculate the scores for each indicator. $Ui = \sum_{j=1}^{n} \omega jXij$

5 Measurement and Result Analysis of the Development Level of Rural Revitalization and New Urbanization in a Regional Province

5.1 Comprehensive evaluation analysis of the development level of rural revitalization in a regional province

The highest weight value in the comprehensive evaluation of rural revitalization in a regional province is rural social development, followed by rural ecological environment, in which farmers' living standards have the lowest weight value, which indicates that the implementation of the rural revitalization strategy in a regional province focuses on rural social development as well as ecological environment management [7].

From the perspective of the three-level indicator layer, the weight value of each indicator is more concentrated, generally distributed between 0.067-0.091, of which the rural sanitary latrine penetration rate has the highest weight value of 0.0909, and crop diversification occupies the lowest weight value of 0.0678; therefore, the implementation of rural revitalization strategy of a certain regional province, in the context of balancing the development of industry, ecological environment, society, and farmers and herdsmen, it is also advisable to focus on the rural ecological environment, especially the governance and construction of the living environment of farmers and herdsmen [8].

During the period 2011-2020, the development level of rural revitalization in two cities and six states of a regional province as a whole showed a trend of steady growth, but in individual years, the comprehensive development level of rural revitalization in some cities and states, such as Haibei Prefecture and Hainan Prefecture, fluctuated, due to the fact that the data on the indicators of agricultural development, ecological environment, and social development of these cities and states showed a relatively large change during the study period, which, to a certain extent, affected their comprehensive evaluation index, but it basically shows a steady upward trend. During the ten-year period, the rural revitalization development of a certain region and city grew faster, from 0.0319 at the beginning of the Twelfth Five-Year Plan to 0.2186 at the end of the Thirteenth Five-Year Plan, and the smallest growth rate was in Guoluo Prefecture, with a growth rate of only 0.06 during the ten-year period.

Taken together, the comprehensive development level of rural revitalization in a regional province from 2011 to 2020 showed a steady growth trend, and there are obvious differences in the level of development among cities and states [9].

5.2 Comprehensive evaluation analysis of the development level of new urbanization in a regional province

In accordance with the characteristics of the comprehensive development index of new urbanization in each city and state, the development level of new urbanization is considered in a hierarchical manner, and is divided into three levels of grades as is the comprehensive level of rural revitalization, of which, at the highest level (i.e., the final score of 0.175 or more), there are a total of two cities in a certain regional city, Haidong City. In the second tier (final score between 0.16 and 0.17) are Hainan, Yushu, Haixi, and Haibei prefectures, a total of four prefectures. A total of 2 states, including the city of Golo and a regional state, are in the third level (final score below 0.16).

A regional municipality located at the highest level has an urbanization rate of 65.7% in 2011 and 78.6% in 2020, and Haidong City has an urbanization rate of 40.4% from 24.4% in 2011 to 40.4% in 2020. It can be seen that the urbanization rate of a certain regional city is always much higher than that of Haidong City, but the evaluation index of its comprehensive level of new urbanization is not much different from that of Haidong City, so the comprehensive level of new urbanization is not simply measured by the urbanization rate [10]. From a general point of view, over a long period of time, the index of the comprehensive development level of new urbanization in a certain region and city has increased by a large margin, which shows that it is still in the stage of rapid urbanization. For the third level of comprehensive development level of new urbanization in a certain region and province, the index of its comprehensive development level of urbanization evelopment level of new urbanization is not substitute.

is on the low side, and the growth rate is smaller than that of other cities and states, and the overall development level of new urbanization is relatively lagging behind.

In order to better grasp the overall situation of the province in a certain region, based on the comprehensive score obtained for a certain regional province, a trend chart of changes in the development level of rural revitalization and new urbanization in a certain regional province during the period of 2011-2020 is drawn, as shown in 1:



Fig. 1. Trends in the development level of rural revitalization and new urbanization in a regional province

According to the trend of the two systems in Figure 1, the development history of rural revitalization and new urbanization in a regional province can be divided into two stages (with the intersection of the two curves in Figure 1 as the time point): the first stage is the level of urbanization development is higher than the rural revitalization, and the urbanization construction in this stage leads the rural revitalization; the graph shows that from 2011-2015, the development of rural revitalization in a regional province showed a fluctuating growth trend, the The comprehensive score increased from 0.019 in 2011 to 0.079 in 2015, with an overall increase of 0.06; during the same period, the comprehensive evaluation index of new urbanization development in a certain regional province was always higher than the comprehensive evaluation index of rural revitalization, and the development of rural revitalization in a certain regional province during this period was changing from slow to fast, while the development of new urbanization was fluctuating upward, which seems to indicate that the development process of rural revitalization in a certain regional province during the study period was slightly lagging behind the development process of rural revitalization. Thus, it seems that during the study period, the development process of rural revitalization in a certain province lagged behind that of new urbanization [11]. The second stage is that the development level of rural revitalization is slightly higher than that of urbanization, and the development of rural revitalization in this stage promotes the construction of urbanization; the figure shows that from 2016 to 2020, the development level of rural revitalization in a

certain regional province shows a trend of rapid growth, and the comprehensive evaluation score in this stage is higher than that of the comprehensive score of new urbanization, and compared with the first stage, the speed of the development of new urbanization continues to grow steadily, and the level of the development of rural revitalization grows in leaps and bounds.

6 Conclusion

The overall goal of rural revitalization is to realize the modernization of agriculture and rural areas through the promotion of industrial prosperity, ecological livability, civilized rural customs, effective governance and affluent living, while the ultimate goal of modernization of agriculture and rural areas is to achieve common prosperity, and the revitalization of the countryside and common prosperity have the intrinsic unity and inevitability of historical and logical development. Under the digital empowerment, the common wealth in the countryside should promote the multi-dimensional and systematic comprehensive development and overall leap in the countryside's politics, economy, culture, society and ecology, so as to achieve a holistic synergy between the productive forces and the relations of production, and between the economic base and the superstructure, and to realize the common wealth between the urban and rural areas as well as the inter-countryside.

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