Research on Variation and Regulation Countermeasure of Rural Residential Land

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Abstract — The research of variation and regulation countermeasure of rural residential land plays an important part in improving production and living standards in rural areas, protecting the cultivated land, alleviating the pressure on construction land and promoting the construction of new countries. In order to discover the variation characteristics of rural residential land use from 1999 to 2008 in shijiazhuang city, find the problems of rural residential land in shijiazhuang city and discover the reasons, the article used comparative analysis, time series analysis, correlation and regression analysis and other methods on the second survey data of land use. The results show that: the overall adjustment trend of rural residential land in shijiazhuang city is obvious, but the regulation effect among different administrative regions are very significant. In the future, the regulation should focus on urban area, xinji city, PingShan Xian and LingShou Xian, with specific measures of reasonably guiding the rural urbanization and improving the rural planning.

Keywords - Rural residential land; Variation characteristics; Regulation countermeasure; Shijiazhuang city

I. INTRODUCTION

Limited by traditional environment and condition of rural economic development, rural residential land has caused phenomenon such as large scale of land use, excessive land area per capita, planning confusion and land idle. Premier Li Keqiang proposed that hollow village problems were highly emphasized in 2014 Government Work Report. Reasonable planning and regulation of rural residential land have been the main constraints of new rural construction and development. With the promotion of new urbanization process, the numbers of towns are increased; population density is increasing in surrounding suburbs and rural-urban continuum, thus the intention of energizing turnover on rural residential land is more and more strong. Invisible circulation of residential land is more and more obvious based on circulation restriction and lack of exit mechanism. The regulation of rural residential land is imminent [1].

II. STATE OF THE ART

At present, scholars at home and abroad are aiming at the research of rural residential land. The research contents were as follows. Firstly, the optimization of spatial distribution in rural residential area [2-5]: There are two aspects — qualitative and quantitative studies on the optimization of spatial distribution in rural residential area. In qualitative study, most scholars analyze the distribution in rural residential area and rural environment based on specific regions from neighborhood relations, interpersonal communication, dwellings, village democracy, etc. Then, location of center villages and distribution optimization can be determined. In quantitative study, empirical research is performed. Scholars use traditional methods such as multi-index comprehensive evaluation and model construction based on the distribution optimization of rural residential area in specific study regions. Meanwhile, with the extensive application of GIS, many scholars also use remote sensing and GIS spatial analysis technology, which qualitatively improves the research methods on the distribution optimization in rural residential area. Secondly, potential estimation and suitability evaluation of land consolidation in rural residential area [6-9]: There are few special researches on land consolidation in rural residential area overseas compared with that in China. Potential evaluation methods of consolidation in rural residential area are policy index method (including construction standard method of rural residential area per person and per family), idle homestead sampling method, method improving floor area ratio, evaluation index system method of comprehensive potential, etc. Thirdly, analysis on temporal and spatial variation and influencing factors on the lands in rural residential area [4]: Scholars at home and abroad always focus on land use change in rural residential area and its driving mechanism. Quantitative analysis is performed based on the specific data of land use change in rural residential area, thus the influence of natural and socio-economic factors on the land use change in rural residential area were summarized. Some scholars analyze the driving mechanism of land use change in rural residential area from family population, family wealth, system policy, etc. The work in this paper focused on the third aspect. There were few researches on variation and regulation of rural residential land combined with particular city at home. Therefore, the work conducted vertical and horizontal contrast analysis to discuss variation

characteristics of rural residential land in Shijiazhuang City based on the second survey data of land use. After finding the main reasons, regulation countermeasures were proposed combined with analysis results [10-12].

III. METHODOLOGY

(1) Research ideas and methodology

In order to discover the characteristics of rural residential land use change from 1999 to 2008 in shijiazhuang city, the article firstly made a time series trend analysis of rural residential area and per capita of rural residential land, then the paper made a comparative analysis of rural residential land between different regions. In terms of cause analysis, the work conducted correlation and regression analysis of data of rural residential land based on the second land survey in Shijiazhuang during 1999-2008. Correlation and regression analysis is one of the common methods using for time series data. In the correlation and regression analysis, time was the first independent variables, while the rural residential land area is the dependent variable. Then the urbanization level was regarded as the second first independent variables to get relations between it and rural residential land. Finally, there were comparisons in differences between regional distributions of consolidation potential in rural residential land.

(2) The sample area

Shijiazhuang area was chosen for the sample. Shijiazhuang, located in south-central Hebei, is part of the Bohai Economic Rim, about 283 kilometers southwest of Beijing. Its administrative area ranges in latitude from 37° 27' to 38° 47' N, and the longitude 113° 30' to 115° 20' E. The prefecture-level city reaches a 147.30 kilometers north-south extent and 171.80 kilometers wide from east to west. The prefecture has borders stretching 760 kilometers long. The data was derived from the second land survey in Shijiazhuang Province in 2008. Data showed that Shijiazhuang covered an area of 1,406,014.13 hectares. According to secondary classification of land use status, urbanization village and industrial mining land were located in the fourth place, with a ratio of 13.21%. The first three were farmland, meadow and forest land, with ratios of

41.41%, 15.33% and 15.02%, respectively. Rural population of Shijiazhuang was more than 75% of the total population. The village land had an area of 127,008.45 hectares in the distribution of urbanization village and industrial mining land. Village land was divided into three types as follows. The first was rural town and countryside; the second was rural town; the third was village committee. Besides, there were some natural villages with small and dispersed population in mountain area. The main function of village was hesitancy for the common people. According to land survey of Shijiazhuang in 2008, rural residential land had a total area of 95,662.52 hectares, accounting for 6.80% of the total area and 75.32% of village area. It had the largest area in urbanization village and industrial mining land, with the ratio of 51.52%. Other village land were sideline, livestock breeding, school sites and village committee [13-15].

V. RESULT ANANLYSIS AND DISCUTION

With large proportion, rural residential land in Shijiazhuang City showed corresponding trend in temporal and spatial variation. According to data of the second land survey, temporal and spatial variation of rural residential land was analyzed as follows.

(1)Temporal and spatial variation of rural residential land in shijiazhuang city

①Area variation of rural residential land

After standardization, data of rural residential land were used to present area variation trend of rural residential land in Shijiazhuang City during 1999-2008 (See Figure 1). Figure 1 showed that rural residential land per capita had faster area growth than rural residential land. After 2006, the difference of decent speed between the two indexes indicated that rural population had negative influence on the variation of rural residential land. In 2006, rural residential land area per capita reached maximum (145.83 m^2), which was less than the highest standard of state (150 m^2). After 2006, the trend of rural residential land area per capita was decreasing, achieving fastest decent speed in 2007. Therefore, extensive use and disorderly expansion of rural residential land were effectively regulated in Shijiazhuang.
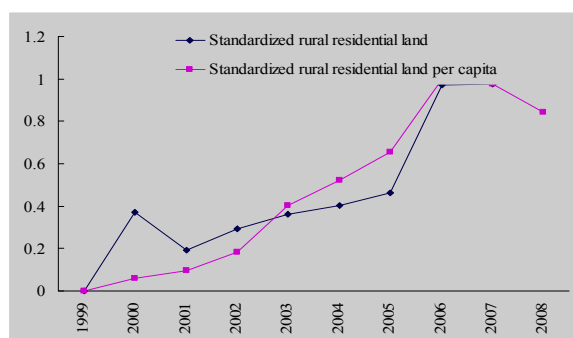

Figure 1. Area variation diagram of rural residential land of shijiazhuang during 1999-2008

② Distribution characteristics of regional differences in rural residential land

Distribution of urbanization villages was affected by factors including geographic position, population gross, population density, social and economic conditions. With the

progress of society and productivity, the distribution range was enlarged to achieve regional residential area—radiation zone of small towns. Before the founding of PRC, people were oppressed by imperialism, feudalism and bureaucratic capitalism, living in poverty. Urbanization village and industrial mining land covered little area. The mine was seized by despotic landlords, leaving housing problems for urban residents and peasants. After the founding of PRC, people developed social productivity to recover national economy and improve life quality on the guidance of Communist Party and people's Government. Industrial mining area was increased with the exploitation of mine and expansion of residential area. [16-18]

After 1978, residential and industrial mining land were rapidly increased with the reform and opening of Shijiazhuang City. Since 1990s, the demand for residential and industrial land was more prominent with the development of social economy and life quality. Based on results of the second national land survey, rural residential land was distributed in each county (city or district), with the total area of 95,662.52 hectares. However, this type of land was closely related to social economy development level, the number of designated towns and villages. Therefore, rural residential land had large area in counties (or cities) with large jurisdiction area, designated towns and villages. Among these counties (cities or districts), Xinji City had the largest area (8,818.9 hectares), accounting for 9.22% of rural residential land in Shijiazhuang City. Gaocheng, Jinzhou City and Pingshan County were in the second, third and fourth places, accounting for 8.36%, 7.26% and 6.98% of the total area of Shijiazhuang City. Other counties (cities) including Urban District, Zhao, Xingtang and Yuanshi County had large jurisdiction area, designated towns and administrative villages. In these counties, there was rural residential land with large area.

Compared with designated towns, villages had wider distribution range in each county (city). Villages were distributed in mountains and plains, with different densities. The distribution and scale of villages were related to industrial development history and population. Plain area had dense population and industrial development history of long standing. Therefore, residential land had large area and even distribution. Investigation results were as follows. In 10 plain districts (Gaocheng, Jinzhou, Xinji, Xinle City, Zhengding, Luancheng, Gaoyi, Shenze, Wuji and Zhao County), the total village area reached 74,798.31 hectares, accounting for 58.89% of that of Shijiazhuang City. Thereinto, Gaocheng City had the largest area (11,973.20 hectares), accounting for 9.43% of village area in Shijiazhuang City and 16.01% of similar land area in Pingyuan County. Xinji City had the second largest area (10,404.78 hectares), accounting for 8.19%. Gaoyi County had the smallest area (3,027.02 hectares), accounting for 2.38%. Limited by topography, mountain area had large land area and small population. Therefore, rural residential land was distributed in valley, basin, piedmont and hill, with small population density and size. In mountain districts (Yuanshi, Pingshan, Zanhuang, Lingshou, Xingtang, Jingxing County, Jingxing mining District and Luquan City), the total village area was 47,570.53 hectares, accounting for 37.45% of similar area in Shijiazhuang. Luquan City had the largest village area (7,750.57 hectares), accounting for 16.29% of total village area in mountain counties and 6.10% of similar area in Shijiazhuang. Pingshan County had the second largest area (7,471.85 hectares), accounting for 5.88%. Except for Jingxing mining District, Zanhuang County had the smallest area (4,668.79 hectares), accounting for 3.68%.

Rural residential area per capita in 2008 was smaller than that in 2007. However, regional difference was obvious. In 7 of 18 administrative regions, residential areas per capita were larger than maximum standard of state (See Figure 2). Regulation range should be within 150 m^2. The 7 administrative regions were Urban District, Xinji City, Shenze, Lingshou, Yuanshi, Pingsha and Jingxing County. Urban District was the key object to control, with residential area of 254.01 m^2 per capita. Residential area of 9 administrative districts was 120.1-150 m^2 per capita, with regulation range of 0-20 m^2 per capita. The two rest districts had residential area of 100.1-120 m^2 per capita, which could be reduced by 0-15 m^2 per capita. According to the total distribution, residential land area per capita was controlled to a certain extent. However, regulation effect was not ideal in specific region distribution. The next step was targeted regulation based on regional difference.
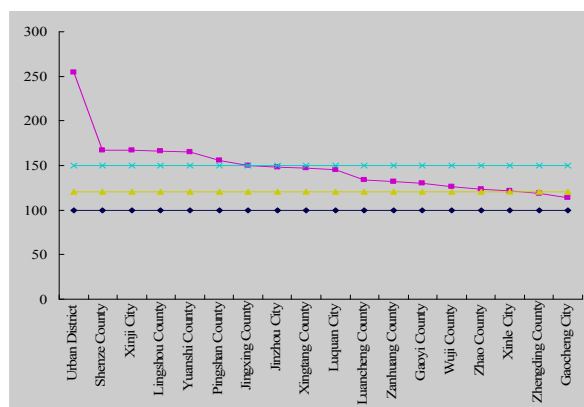

Figure 2. Distribution difference of residential land area per capita in administrative districts in shijiazhuang city

③ Regional difference distribution of consolidation potential in rural residential land

Consolidation potential in rural residential land could be calculated according to national land standard for rural construction or household standard in Hebei Land Management Regulation. The calculation steps were as follows. Firstly, different standards were used to obtain the planning area of rural residential land in 2020. After that, the above area was used to subtract rural residential area at present calculated by the same method. Combined with rural planning population in 2020, the paper obtained consolidation potential of rural residential land in Shijiazhuang City. Results calculated by the two methods had similar line type, although with slight difference (See Figure 3).

Figure 3 showed that consolidation potentiality based on national standard were slightly larger than those based on Hebei provincial standard. However, consolidation potentiality based on the two standards had coincident tendency. Consolidation potentiality of rural residential land reached the maximum in Urban District. The next were those in Xinji City and Pingshan County. The administrative regions with smallest consolidation potentials were Gaocheng City, Gaoyi and Zanhuang County

(2) Variation reason of rural residential land

According to results of temporal and spatial analysis, relative factors were compared to explore variation reason of rural residential land in Shijiazhuang City.

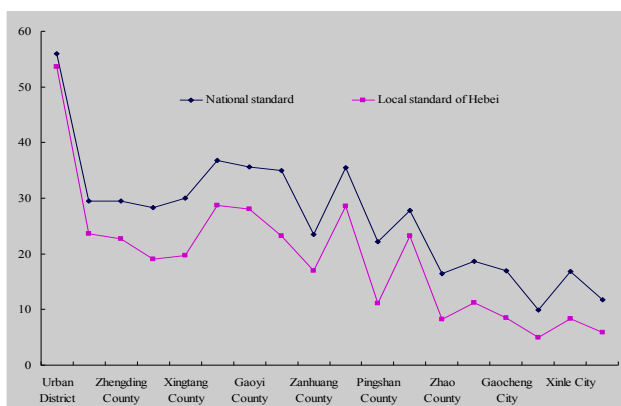① Contrast of rural residential land and population variation

Figure 3. Consolidation potentiality distribution of rural residential area in administrative regions in shijiazhuang city

Variations of rural residential land and population were analyzed by comparison (See Figure 4). Rural population in Shijiazhuang tended to decrease since 2000. However, rural residential land increased. Therefore, rural population was not the main reason of rural residential growth. Rural residential land should be governed to eliminate waste.
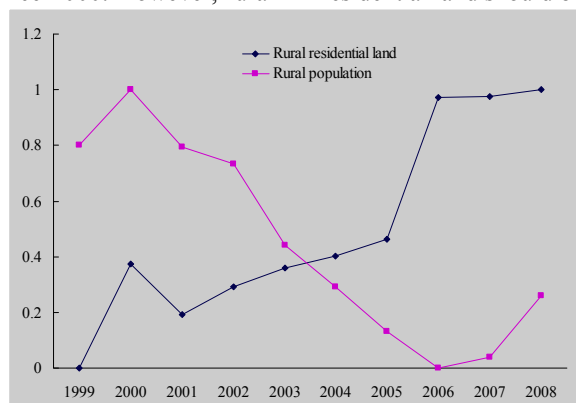

Figure 4. Comparison of rural residential land and population in shijiazhuang city during 1999-2008

② Relative analysis of rural residential land and urbanization level

Relative analysis of rural residential land and urbanization level showed that the relative coefficient reached 0.94 (See Figure 5). Thereinto, urbanization level was measured by the ratio of urban population in the total population. With different units, the two indexes were compared after standardization. The standardization steps were as follows. Firstly, we subtracted minimum of the whole observation periods from index value at different periods. After that, the above difference was divided by the difference between maximum and minimum of the whole observation periods. The obtained standardized value was between 0 and 1. The two variables were highly correlated.

Therefore, they were fitted by regression equation to derive optimal relation expressed as quadratic curve equation. Urbanization level and rural residential land after standardization were set as independent and dependent variables (X and Y). According to data during 1999-2008, we obtained quadratic curve model:

$$Y = 0.3223X^2 + +0.5387X + 0.0697 \qquad (1)$$

The corresponding coefficient of determination R^2 was 0.8885, presenting better fitting effect. Prediction model showed that rural residential land obviously increased with the improvement of urbanization level.

③Sequence comparison of consolidation potentiality and per capita distribution of rural residential land in different administrative regions

There was few difference between consolidation potentials of rural residential land based on national standard or Hebei provincial standard in different administrative regions. The sequence of rural residential land per capita did not agree with that of consolidation potentials of rural residential land in different administrative regions.

Consolidation potentialitys of rural residential land in 18 regions were divided into high, medium and low levels. After sequencing of consolidation potentiality, the 1-6 positions were taken as high level; 7-12 positions were as medium level; 13-18 positions were as low level. With the same method, rural residential lands per capita in 18 administrative regions were also divided into three levels. Table 1 showed grade distribution of administrative regions. Thereinto, "high-high" stood for high levels of consolidation potentiality of residential land and rural residential land per capita. Other expressions were similar. Consolidation potentialitys of rural residential land were the averages of calculation results based on national and Hebei provincial standards. Table 1 showed that four administrative regions (Urban District, Xinji City, Pingshan, County and Lingshou County) had large consolidation potentials and rural residential land per capita. These regions were the most important objects for consolidation. "High-medium" and "medium-high" regions were secondary important. [19-20]
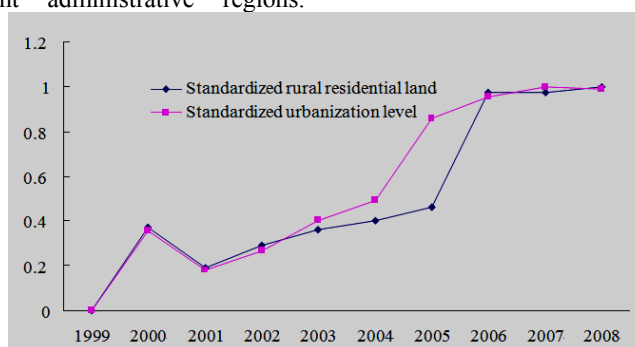

Figure 5.   Comparison of urbanization level and rural residential land in shijiazhuang city during 1999-2008

TABLE I   CONSOLIDATION POTENTIALITY AND PER CAPITA DISTRIBUTION OF RURAL RESIDENTIAL LAND IN DIFFERENT ADMINISTRATIVE REGIONS

Administrative Region	Sequence of Consolidation Potentials of Rural Residential Land	Sequence of Per capita Area of Rural Residential Land	Comprehensive Grade
Urban District	1	1	High-High
Xinji City	2	3	High-High
Pingshan City	3	6	High-High
Jinzhou City	4	8	High-Medium
Zhengding City	5	17	High-Low
Lingshou City	6	4	High-High
Yuanshi County	7	5	Medium-High
Shenze County	8	2	Medium-High
Jingxing County	9	7	Medium-Medium
Xingtang County	10	9	Medium-Medium
Luancheng County	11	11	Medium-Medium
Zhao County	12	15	Medium-Low
Luquan City	13	10	Low-Medium
Wuji County	14	14	Low-Low
Xinle City	15	16	Low-Low
Gaocheng City	16	18	Low-Low
Gaoyi County	17	13	Low-Low
Zanhuang County	18	12	Low-Medium

VI. CONCLUSION

This paper successfully discovered the characteristics of rural residential land use change from 1999 to 2008 and proposed organic integrations of time and space research on rural residential land use change in shijiazhuang city. The work conducted correlation and regression analysis of data of rural residential land based on the second land survey in Shijiazhuang during 1999-2008. The combination study of space and time on characteristics of rural residential land use can provide effective empirical countermeasures for rural land use planning. Therefore, regulation of rural residential land in Shijiazhuang City is suggested as follows. However, further research based on this combination study of space and time is necessary, especially for scientific location and layout planning of rural settlement land. The main conclusions of this paper are presented below.

(1)For rural residential land, extensive use and disorderly expansion have been regulated in Shijiazhuang. Data show that per capita area of rural residential land tends to decrease since 2006. According to correlation analysis of rural residential land, population and urbanization level, reform of new urbanization results in the increase of rural residential land and urbanization level rather than the decrease of rural residential land. Rural urbanization should be rationally guided by improving rural land market and infrastructure construction.

(2)According to per capita distribution of rural residential land in administrative regions, local regulation effect is not ideal in Shijiazhuang. In 7 of 18 administrative regions, per capita areas of rural residential land are beyond national standard. According to calculation in administrative regions, Urban District has highest consolidation potential of rural residential land. The next are Xinji City and Pingshan County. Gaocheng City, Gaoyi County and Zanhuang County have lowest consolidation potentials.

(3)In regulation and consolidation of rural residential land, different regions should be separately treated. Among 18 administrative regions in Shijiazhuang, 7 regions have per capita areas larger than the highest standard of state, with the adjustment range of less than 150 m^2; 9 regions have per capita areas of 120.1-150 m^2. Four administrative regions (Urban District, Xinji City, Pingshan, County and Lingshou County) have large consolidation potentials and rural residential land per capita. These regions are the most important objects for consolidation, and "High-medium" and "medium-high" regions are secondary importance.

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