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# Empirical Analysis on the Rural Urbanization Development in Luoyang City, China

GUO You-rong \*

Luoyang Normal University, Luoyang 471022, China

**Abstract** Development status of rural urbanization in Luoyang City is introduced. A total of 6 indices are selected, such as total households in townships, total population in townships, total grain output, financial budget income, balance of savings deposits at the end of the year, and per capita net income of farmers. According to the data in 2009 *Luoyang Statistical Yearbook*, cluster analysis of 53 designated towns is carried out. Result shows that 53 designated towns are divided into 4 types according to the economic strength. Problems in the development of rural urbanization in Luoyang City are analyzed, such as imperfect management system, lack of effective economic measures, irrational town layout, unbalanced regional development, inadequate urban infrastructure, limited population absorption, lack of main industry in small towns, insufficient development capital, serious environmental pollution, and great pressure on environmental protection of towns. Countermeasures for the development of rural urbanization in Luoyang City are put forward. For instance, judging from the dynamic mechanism, Luoyang City should gradually change its dynamic mechanism of urbanization into socialist market system. Judging from the scale of town, Luoyang City should actively develop the central city and cultivate strong counties and key towns. Judging from the function of town, Luoyang should select a special urban development mode with its own characteristics for its development of rural urbanization.

**Key words** Luoyang City, Rural urbanization, Cluster analysis, China

With the development of economic society, rural urbanization has become the strategic focus and breakthrough of China's modernization construction. Urbanization level is an important sign for the social and economic development level of a region or a country. Urbanization in rural China is of distinctive local characteristics and should find out an urbanization road suitable for their own development. Luoyang City is an old industrial area and is second only to Zhengzhou City in Henan Province. But in the year 2007, the urbanization level in Luoyang City is only 41.1%, which is 20.2% lower than Zhengzhou City and takes the sixth place in all the nine districts of the whole province. Proportions of secondary industry and primary industries account for 60.7% and 10.0% of the total GDP, respectively. But agricultural population only accounts for 60% of the total population in Luoyang<sup>[1]</sup>. And a large number of rural people stay in rural areas. At present, Luoyang City is facing the opportunity of implementing the rising strategy in central region, and enjoys all the preferential policies of revitalizing the northeast old industrial base. Therefore, a rare historical opportunity for the great development of industrial economy in Luoyang City has arrived. However, county and small-town economy is lagging behind in Luoyang City. And the policy of "Industry Promotes Agriculture, Urban Area Elevates Rural Area" is hard to be implemented. Accelerating the pace of urbanization in rural areas is an important task for the strategic adjustment of economic structure, as well as a major channel to solve the problems in economic and social development in Luoyang City, especially the "Three Agriculture Problem". Current status of rural urbanization in Luoyang is analyzed by combining the quantitative or qualitative analysis together. Ac-

ording to the analysis result of econometric model, problems in the development of rural urbanization of Luoyang City are found out. Development mode of rural urbanization suitable for Luoyang City is found out, which aims to offer references for the rural urbanization of Luoyang City.

## 1 Development status of urbanization in Luoyang City

Until the year 2008, Luoyang has jurisdiction over 7 municipal districts, 1 county-level city, 8 counties, and 62 designated towns. Among them, the 7 municipal districts are Jianxi District, Xigong District, Laocheng District, Chanhe District, Luolong District, Jili District, and Luonan District. 1 county-level city is Yanshi City. And the 8 counties are Mengjin County, Xinan County, Luoning County, Yiyang County, Yichuan County, Song County, Luanchuan County, and Ruyang County<sup>[2]</sup>. In order to speed up the process of urbanization, Luoyang City established 15 designated towns in the year 2009 and the number of designated towns reaches 77 at the end of the year 2009, which exceeds the number of villages for the first time. Total townships in Luoyang City are 143. And at the end of the year 2008, total household population is 6 544 thousand. Among them, non-agricultural population is 1 043 thousand and urban population is 2733 thousand. Urbanization rate reaches 41.8%<sup>[3]</sup>. Table 1 reports the resident population and urban population in Luoyang City since the year 2000<sup>[3]</sup>.

## 2 Cluster analysis of rural urbanization in Luoyang City

### 2.1 Index selection, data source and research method

**2.1.1** Index selection. A total of 6 indices are selected, such

as total households in townships, total population in townships, total grain output, financial budget income, balance of savings deposits at the end of the year, and per capita net income of

farmers. And cluster analyses on 53 designated towns are carried out.

**Table 1** Number and composition changes of urban population in Luoyang City

Year	Resident population// ×10 <sup>4</sup>	Urban population// ×10 <sup>4</sup>	Rural populaion// ×10 <sup>4</sup>	Urbanization rate //%	Growth of urbanization rate //%
2000	624.3	184.8	439.5	29.6	-
2001	628.4	191.0	437.4	30.4	0.8
2002	632.1	200.4	431.7	31.7	1.3
2003	636.2	214.4	421.8	33.7	2.0
2004	638.4	226.8	411.6	35.5	1.8
2005	641.7	243.9	397.8	38.0	2.5
2006	646.0	252.1	393.9	39.0	1.0
2007	650.5	260.9	389.6	40.1	1.1
2008	654.4	273.3	381.1	41.8	1.7

**2.1.2** Data source. Data are from the 2009 *Luoyang Statistical Yearbook*<sup>[3]</sup>.

**2.1.3** Research method. Clustering is to divide data into different clusters, which classifies things according to their similarity degree and finds out the diagnostic tool for the things with different characteristics. Hierarchical cluster analysis is carried out. And its fundamental steps are:

(1) Variable selection. Objectives of variable and cluster analysis are closely related, which reflect the characteristics of classification object. Several indices are selected to analyze the influencing factors of urbanization quality. It is assumed that the following data matrix is constructed by the initial data:

$$\begin{bmatrix} X_{11} & X_{12} & \cdots & X_{1p} \\ X_{21} & X_{22} & \cdots & X_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ X_{n1} & X_{n2} & \cdots & X_{np} \end{bmatrix}, \quad (1)$$

where *n* is the number of samples, *p* is the number of primitive variables, *x<sub>ij</sub>* is the data value of the *i*th unit at the *j*th variable.

(2) Standardization of the data. Assuming that *x<sub>ij</sub>* is the original observations,  $\bar{x}$  is the mean value of data, and *S* is standard deviation. Hence, observed value after standardization (*x'ij*) becomes

$$x'_{ij} = \frac{x_{ij} - \bar{x}}{S}. \quad (2)$$

(3) Measurement of similarity. In order to clustering the objects with high similarity together, distance measure method is adopted to research on the similarity among objects. The closer the point is, the higher the similarity becomes. And it is more likely to be divided into the same group<sup>[4]</sup>. Euclidean distance *d<sub>ik</sub>* between the *i*th row and the *k*th row in matrix is determined, which is

$$d_{ik} = \sqrt{\sum_{j=1}^p (x_{ij} - x_{kj})^2}. \quad (3)$$

(4) Classification. According to the calculation, the result can be divided into several types. Then, class mean distance method is adopted to achieve the minimum average distance between samples. The corresponding two units of samples belong to different types. Its equation is

$$D_{rs}^2 = \frac{n_i}{n_r} D_{si}^2 + \frac{n_j}{n_r} D_{sj}^2, \quad (4)$$

where *D<sub>rs</sub><sup>2</sup>* is the distance recurrence formula of *G<sub>r</sub>* and *G<sub>s</sub>*, *G<sub>s</sub><sup>2</sup>*

and *D<sub>sj</sub><sup>2</sup>* are the square of the distances between the *G<sub>r</sub>* and the *G<sub>i</sub>* and *G<sub>s</sub>*, respectively.

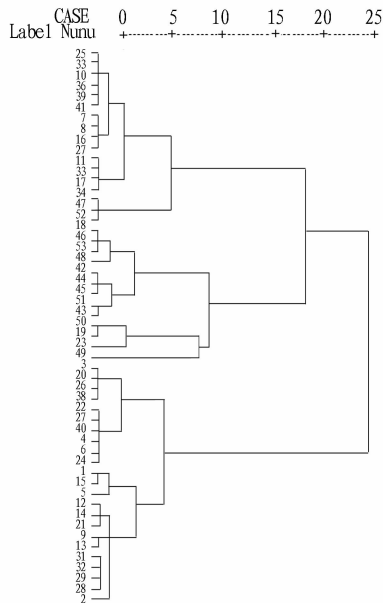
**2.2 Evaluation result of rural urbanization quality in Luoyang City**

In order to compare the urbanization quality, classification research on designated towns is carried out according to certain standards. Based on the initial data, clustering analysis method mentioned above is used to conduct data processing by SPSS software. Table 2 reports the 53 designated towns obtained in Luoyang City and Fig. 1 illustrates the result of cluster analysis.

**Table 2** Codes of 53 designated towns in Luoyang City

Code	Designated town	Code	Designated town
1	Mangshan Town	28	Yanzhuang Town
2	Xindian Town	29	Shangdian Town
3	Guanlin Town	30	Fudian Town
4	Longmen Town	31	Xiaodian Town
5	Anle Town	32	Fengli Town
6	Baimasi Town	33	Liuquan Town
7	Huimeng Town	34	Hancheng Town
8	Pingle Town	35	Baiyang Town
9	Songzhuang Town	36	Xuncun Town
10	Baihe Town	37	Huizu Town
11	Zhaoyang Town	38	Shangge Town
12	Xiaolangdi Town	39	Minghao Town
13	Matun Town	40	Shuizhai Town
14	Hengshui Town	41	Pengpo Town
15	Shisi Town	42	Shouyangshan Town
16	Wutou Town	43	Dianzhuang Town
17	Cijian Town	44	Zhaizhen Town
18	Tiemen Town	45	Yuetan Town
19	Chitudian Town	46	Guxian Town
20	Heyu Town	47	Goushi Town
21	Tantou Town	48	Fudian Town
22	Sanchuan Town	49	Gaolong Town
23	Lengshui Town	50	Koudian Town
24	Taowan Town	51	Pangcun Town
25	Tianhu Town	52	Licun Town
26	Jiuxian Town	53	Zhuye Town
27	Checun Town		

Fig. 1 illustrates that the 53 small towns can be classified into 4 types according to the quality of townships. The compari-



**Fig. 1 Cluster Analysis result of the 53 designated towns in Luoyang City**

son shows that there is only 1 first-class town, which is Guanlin Town with the characteristics of strong economy strength and high income of farmers. The 3 second-class towns are Xindian Town, Baimasi Town and Anle Town, which are all located in urban district with secondary and tertiary industries being the leading industries. Therefore, these 3 towns have certain economic strength and farmers have relatively high income with a certain amount of savings. The 5 third-class towns are Longmen Town, Chitudian Town, Lengshui Town, Shisi Town, and Huizu Town, which are located in Luolong District, Luanchuan County, Xinan County and Luoning County, respectively. Cha-

**Table 3 Development status of townships in Luoyang City**

Area	Number of townships		Total population// $\times 10^4$	Urban population// $\times 10^4$	Urbanization rate//%
	Designated town	Village			
Urban district	6	8	155.1	120.1	77.4
Yanshi City	13	3	85.2	65.1	76.4
Mengjin County	9	1	46.0	42.3	91.9
Xinan County	5	6	50.2	30.4	60.5
Luanchuan County	7	7	32.9	17.6	53.4
Song County	6	10	55.2	21.2	38.4
Ruyang County	4	9	43.1	13.6	31.5
Yiyang County	6	11	66.4	31.1	46.8
Luoning County	3	15	45.2	7.2	15.9
Yichuan County	4	10	75.2	20.8	27.6

### 3.3 Inadequate urban infrastructure; limited population absorption

Factors causing the "city disease", that is the limited population absorption, are as follows. Firstly, education level of farmers is relatively low. Fierce competition in employment requires high quality of talents, so that labor forces with poor educational history can not obtain a long-term stable job. Major cities can not absorb agricultural labor forces for a long time. Secondly, urban housing, road, water, electricity, health care and other infrastructures have a limited carrying capacity.

Characteristics of these 5 towns are low economic scale, insignificant leading industry, low income and few savings of farmers. All the rest towns belong to the fourth-class town with the characteristics of lack of leading industry, backward economy, little fiscal revenue and farmers' income.

## 3 Problems in the rural urbanization in Luoyang City

**3.1 Imperfect management system; lack of effective economic measures** Due to the lack of effective guidance of policy, construction of small towns is usually insignificant in rural areas. Surplus rural labor forces transferred in urban areas are facing a series of problems, such as household, housing and social security, which all lack concrete and effective measures to tackle these problems. At present, urban construction in some areas is only blindly dividing land or building houses without inviting investments for secondary and tertiary industries. Moreover, diversified investment mechanism has not established and urban construction relies only on government investment.

**3.2 Irrational town layout; unbalanced regional development** Population of Luoyang City is concentrated in Dushi District and Yanshi District, which weakens the economic link between Dushi and county and reduces the number of county towns with backward economy. For instance, Yichuan County has a population of 752 thousand at the end of the year 2008 with only 4 designated towns; while Yanshi, which is a county city, has 852 thousand population and 13 designated towns. Thus, distribution of townships is unreasonable. Besides, urbanization rates of both urban district and Yanshi City are close to the average level of the whole province. Their economic development level is relatively high, along with low urbanization level of county and unbalanced economic development. Table 3 reports the development status of townships in Luoyang City<sup>[3]</sup>.

One of the differences between urban and rural areas is that urban area has complete urban infrastructure, which is the prerequisite for the existence and development of urban area. According to the single data, popularization rate of water is 66.68% in urban area, which is far lower than the provincial level of 92.2%; popularization rate of gas is also lower than the provincial level of 68.9%. Number of buses owned by every ten thousand people is 6.72, which is far smaller than the average level of Henan Province (7.8)<sup>[3]</sup>. Thirdly, medical, pen-

sion, unemployment and other social security system are not perfect for urban residents. On the whole, Luoyang City and small towns take the expansion of urban built-up area as the key objective, which occupies the land uses around cities. Moreover, there lacks the ability of operating the existing urban areas and the land use efficiency is low.

**3.4 Lack of main industry in small towns; insufficient development capital** During the process of urbanization, increase of the number of towns is emphasized, but the develop-

ment of local industry is neglected. Most of the towns in Luoyang have both heavy industry and light industry, which is a representative of underdeveloped economy. At present, rural areas in China is at the turning period from enough food and cloth to well off. Urbanization in most areas needs more capital. And the insufficient input in rural areas has seriously delayed the process of rural urbanization. Table 4 reports the social and economic development status in counties (cities) of Luoyang City<sup>[3]</sup>.

**Table 4 Social and economic development status in counties (cities) of Luoyang City**

Area	Total population ×10 <sup>4</sup>	Per capita net income of farmer//Yuan	Savings deposits of residents//Yuan	Gross industrial output value// ×10 <sup>4</sup> yuan
Urban district	155.1	5 349.3	106 535.8	4 514 652
Yanshi City	85.2	6 474.4	28 168.4	6 572 429
Mengjin County	46.0	4 031.4	31 494.6	1 270 960
Xinan County	50.2	4 658.5	61 264.8	4 938 641
Luanchuan County	32.9	4 351.8	71 271.4	2 171 142
Song County	55.2	3 980.9	25 196.3	867 643
Ruyang County	43.1	3 979.6	21 429.2	932 989
Yiyang County	66.4	3 934.4	15 806.8	1 084 706
Luoning County	45.2	3 946.8	10 406.2	833 080
Yichuan County	75.2	4 451.5	23 999.3	4 190 157

**3.5 Serious environmental pollution; great pressure on environmental protection of towns** With the acceleration of urbanization in Luoyang, the environmental problems become increasingly apparent. Many small towns only pay attention to economic development, and to establish a large number of small enterprises with great pollution and poor sewage removing capability, which cause serious air pollution and water pollution. For instance, Luanchuan County produces massive amounts of pollution due to the exploitation of molybdenum mineral and the aluminium processing of electric power group. Development of towns should not be achieved at the expense of the environment. Therefore, environmental protection can not be neglected during the process of urbanization.

## 4 Suggestions and countermeasures

**4.1 Judging from the dynamic mechanism, Luoyang City should gradually change its dynamic mechanism of urbanization into socialist market system** With the development of socialist market system, urbanization promoting mode should turn the top-down promotion of the state into the combination of top down and bottom up together. Market mechanism plays a more and more important role<sup>[5]</sup>. Therefore, development mode of rural urbanization in Luoyang City should emphasis the marketing-oriented and government-driving development mode. Its dynamic mechanism should be changed from single investment of the state into a diversified investment pattern of the state, the collective, individual and foreign capital, and from national regulation into the combination of national regulation and market regulation. At present, economic development level of Luoyang City is relatively backward with imperfect urban infrastructure and urban management level. Therefore, government plays a very important role in promoting the development of urbanization.

**4.2 Judging from the scale of town, Luoyang City should actively develop the central city and cultivate strong counties and key towns** Firstly, Luoyang should exert its strong radiation and driving function, promote the rapid development of surrounding villages and towns and the village in city, integrate them into cities, and accelerate the development of urban agglomeration. Secondly, Yanshi City, as a medium-sized city, has concentrated a considerable number of economic power, and has adopted various measures to help the expansion into big city, which is of important significance to the economic structure adjustment and the urbanization of Luoyang City. Secondly, Mengjin, Xinan and Yiyang Counties are designed to be medium-sized cities, because they all have more than 30 population. At the same time, number of designated towns should be increased in Luoning, Yichuan and Ruyang Counties, which can promote the development of rural areas. Finally, cultivating key towns means to take the towns with good development foundation and great development potential as the key towns, so that they will have more than 100 thousand population, will become the economic growth center, and will promote the economic development of counties and villages.

**4.3 Judging from the function of town, Luoyang should select a special urban development mode with its own characteristics for its development of rural urbanization** According to the areas with rapid development of rural urbanization in China, they have one thing in common, that is, they all pay attention to the cultivation and development of special town and characteristic town. Firstly, since Luanchuan County has more than 20 natural landscapes, development of tourism should be used to meet the needs of the adjustment of agricultural economy and the transfer of rural surplus labor force. Secondly, Mengjin County has formed four leading industries of

farmers' income be effectively improved.

(6) Fixed asset investment level in rural areas has no big influence on the farmers' income. Since there are little programs which could directly promote the farmers' income growth in the fixed asset investment of urban areas except for some infrastructure construction, the effectiveness of which, however, obviously delay. Therefore, we should increase the investment in rural areas on those programs which could directly improve the farmers' incomes.

### 3 Conclusion

There are a lot of factors influencing the growth of the farmers' income, so in order to keep a continuous growth of the farmers' income, a long-term mechanism must be established. We should find out the main influencing factors and then sustain them through formulating corresponding policies and regulations so as to promote the continuous growth of the income. To be specific, currently we should focus on improving the per capita consumption level of the farmers and accelerating the pace of urbanization and industrialization, meanwhile improving rural scientific and technological level as well as the farmers' education level. The current consumption level in our rural areas is still not high, although the government has offered subsidies to the home appliances going to the countryside, the farmers' worries are still not completely eliminated. And thus the consumption of the farmers has still not achieved the desired level. Therefore, the government should take further measures to enable farmers to consume without worries. It should enhance the support for rural endowment insurance policies and expand the coverage and amount of money of the rural medical insurance.

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cow breeding, pollution-free vegetable, flower and plant product, and tobacco planting. Three industries should be developed, so as to comprehensively promote the development of Mengjin County. Thirdly, Xinan County and Yiyang County have various land types of mountain, hilly and valley. Therefore, large-scale enterprises should be made full use of to realize the development of counties. Fourthly, based on the existing industrial system, Song County should make use of Funiu Mountain, Waifang Mountain, Xionger Mountain, Yi River, Ru River, and Bai River to vigorously develop tourism, and to stress on both industry and tourism. Fifthly, Ruyang County is rich in specialty and resources with more than 200 types of economic forests. It is the planting base of national high-quality tobacco and peanut. Therefore, driving mode of agricultural industrialization leading enterprise should be adopted. Sixthly, Luoning County should adopt the rural characteristic planting mode because it is a typical mountainous agricultural county. Seventhly, Yichuan County is rich in resources with 37 types of minerals. Therefore, it should expand and strengthen mineral enterprises and promote the development of urbanization.

Moreover, reduce the education costs of rural residents, relax the restriction on the farmers' coming into city so as to promote the orderly flow of farmers. The integrated measures enable a steady growth in peasants' incomes.

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### 5 Conclusion

Urbanization is the need for modernization, an effective means for the rapid economic development of mountain area and underdeveloped area, and the major route to solve the "Three Agricultural Problems". Due to the low urbanization level, limited radiation of central city and the unbalanced development of counties, development mode of rural urbanization in Luoyang City should take the road of diversified small towns according to their own advantages<sup>[6]</sup>.

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