AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

# Benefit Evaluation on Land Comprehensive Consolidation in the Small Towns

## ——A Case of Daxing District, Beijing, China

**JIANG Cui-hong[1], LI Hong[1*], LI Guang-yong[2], JIA Jin-song[1]**

1. Institute of Agricultural Integrated Development, Beijing Academy of Agricultural and Forestry Sciences, Beijing 100097, China; 2. The Agricultural Committee of Daxing District in Beijing, Beijing 102600, China

**Abstract** Taking Daxing District, Beijing, China as a example, benefit evaluation index system of small-town land comprehensive consolidation is established from four aspects of resource benefit, economic benefit, social benefit and ecological benefit. Weight of evaluation index is determined by analytic hierarchy process. After the standardized treatment on the original value index, comprehensive index method is adopted to evaluate the land comprehensive consolidation benefits in 14 towns of Daxing District in the year 2005, combining with the index weight determined by analytic hierarchy process. Evaluation result shows that areas having significant effects are Yizhuang Town, Xihongmen Town, Yinghai Town, and Jiugong Town, which are concentrated in rural-urban continuum with significant location advantages and good economic and infrastructure status. Areas having good effects are Changziying Town, Huangcun Town, Panggezhuang Town, Beizangcun Town, and Yufa Town, which are located along Yongding River, with abundant farmland resources and good ecological environment. Areas having general effects are Weishan Town, Qingyundian Town, and Anding Town, with insignificant location advantages. Areas with no significant effects are Lixian Town and Caiyu Town, with relatively poor location, resource, and economic development status.

**Key words** Small town, Land comprehensive consolidation, Benefit evaluation, Index system, China

With the rapid development of urbanization and the increase of population, ecological environment is becoming worsening, which seriously hinders the sustainable development of small towns. In view of the status, problem and role of small towns in social development in China, land comprehensive consolidation is of great significance to promote the construction of small towns, to strengthen the sustainable development capability of small towns, and to realize the urban and rural harmonious development. Land comprehensive consolidation of small towns is to improve the ecological environment and living environment of small towns, to protect natural landscape, and to enhance the integrated production capacity of agriculture and the sustainable use ability of resources by optimizing the allocation of land resources, the consolidation benefit of which is a comprehensive benefit. Taking Daxing District, Beijing, China as an example, resource, economy, society and ecological benefit are selected as the breakthrough points to construct index system, based on the existing evaluation theory and method. Land comprehensive consolidation benefits in 14 towns of Daxing District in the year 2005 are evaluated, so as to provide references for the evaluation of land consolidation benefit in the rural-urban continuum.

## 1 Status of research area

Daxing District (39°26′ – 39°50′N, 116°13′ – 16°43′E), having an overall land area of 1 036.32 square kilometers, connects Fengtai and Chaoyang Districts in the north, Langfang City, Guan County and Zhuozhou City in the south, and Tongzhou District in the east. Daxing District and Fangshan District face each other across the Yongding River in the west. Daxing District is located in the middle latitude area and is affected by westerlies, with cold north wind and little rain and snow in spring and winter, hot and rainy climate in summer, and clear and crisp days in autumn. In general, Daxing District has four distinct seasons and moderate precipitation, belonging to warm temperate semi-humid climate zone. The land tilts from northwest to southeast with 15 – 45 meters of ground elevation and 0.5‰ – 1‰ gradient. Daxing District has jurisdiction over 14 towns and 2 state-owned farms, which are plain areas. Evaluation range of this research only includes the 14 towns.

## 2 Data source, index construction and research method

**2.1 Data source** Data are mainly from 1995 and 2005 land use data, social and economic data and remote sensing image of towns in Daxing District, Beijing.

**2.2 Index construction** Based on the theoretical research on land comprehensive consolidation benefit evaluation of small towns, multi-index evaluation method is used to construct a there-layer comprehensive evaluation index system, which is target layer, criterion layer and index layer, according to the scientific and practicable, comprehensive and representative, dynamic and static, systematic and multi-level, comparable and reliable, and operable principles[1-2]. Table 1 reports the evaluation on land comprehensive consolidation benefit. And the evaluation on land comprehensive consolidation benefit of small towns in Daxing District is carried out from four aspects of resource bene-

Received: May 24, 2010 Accepted: June 18, 2010
* Corresponding author. E-mail: caujiangch@126.com

fit, economic benefit, social benefit and ecological benefit.

**Table 1 Benefit evaluation index system of land comprehensive consolidation of small towns in Daxing District**

| Target layer | Criterion layer | Index layer |
|---|---|---|
| Benefit evaluation index system of land comprehensive consolidation of small towns in Daxing District | Resource benefit $U_1$ | Land utilization rate $V_1$ |
| | | Water utilization rate $V_2$ |
| | | Unit GDP energy consumption $V_3$ |
| | Economic benefit $U_2$ | Per capita GDP $V_4$ |
| | | Growth rate of per capita GDP $V_5$ |
| | | Urbanization level $V_6$ |
| | | Industrial structure index $V_7$ |
| | Social benefit $U_3$ | Population density $V_8$ |
| | | Electricity consumption per capita $V_9$ |
| | | Employment proportion $V_{10}$ |
| | | Level of infrastructure construction $V_{11}$ |
| | Ecological benefit $U_4$ | Investment level of environmental protection $V_{12}$ |
| | | Air quality index $V_{13}$ |
| | | Greenland coverage rate $V_{14}$ |

### 2.3 Research method

**2.3.1** Standardization of evaluation index. In order to strengthen the operability of benefit evaluation on land comprehensive consolidation in small towns, dimensionless treatment on index value should be firstly carried out, which is the basis for multiple index comprehensive evaluation. Its equation is

Positive index: $D_i = B_i / M_i$,

Negative index: $D_i = M_i / B_i$,

where $D_i$ is the standardized value of the $i$th index factor, $B_i$ is the actuality value of the ith index factor in the year 2005, and $M_i$ is the actuality value of the ith index factor in the year 1995.

**2.3.2** Determination of the evaluation index weight. Analytic hierarchy process is adopted to determine the weight of evaluation factor. Land comprehensive consolidation benefit system of small towns in Daxing District is broken down into indices at different layers. Judgment matrix is established based on the analyses of index relationship between layers and within a layer. Weight of criterion layer to target layer is calculated, as well as the weight of index layer to criterion layer, and the weight of index to overall target (Table 2).

**2.3.3** Evaluation method. Based on the secondary index weight obtained by analytic hierarchy process and data standardized treatment, comprehensive index method is used to evaluate the land comprehensive consolidation benefit of 14 towns in Daxing District. Its equation is

$$F = \sum V_i \times W_i,$$

where $F$ is the comprehensive evaluation index of small-town land comprehensive consolidation benefit, $V_i$ is the $i$th index value at index layer, $W_i$ is the weight of the $i$th index value at index layer.

## 3 Result and analysis

Evaluation equation of comprehensive index method is used to assess the land comprehensive consolidation benefits of towns in Daxing District in the year 2005. Table 3 reports the evaluation result.

**Table 2 Index weight of benefit evaluation on land comprehensive consolidation of small towns in Daxing District**

| Index | Weight | Index | Weight |
|---|---|---|---|
| $V_1$ | 0.021 305 | $V_8$ | 0.069 203 |
| $V_2$ | 0.035 306 | $V_9$ | 0.042 711 |
| $V_3$ | 0.050 102 | $V_{10}$ | 0.034 321 |
| $V_4$ | 0.193 401 | $V_{11}$ | 0.071 217 |
| $V_5$ | 0.108 542 | $V_{12}$ | 0.032 862 |
| $V_6$ | 0.076 255 | $V_{13}$ | 0.070 104 |
| $V_7$ | 0.041 254 | $V_{14}$ | 0.153 417 |

**Table 3 Evaluation comprehensive index of land comprehensive consolidation benefits of small towns in Daxing District**

| Name of town | Comprehensive index | Sorting value | Name of town | Comprehensive index | Sorting value |
|---|---|---|---|---|---|
| Yizhuang Town | 3.861 | 1 | Beizangcun Town | 1.957 | 8 |
| Xihongmen Town | 3.818 | 2 | Yufa Town | 1.691 | 9 |
| Yinghai Town | 3.728 | 3 | Weishanzhuang Town | 1.669 | 10 |
| Jiugong Town | 3.354 | 4 | Qingyundian Town | 1.549 | 11 |
| Changziying Town | 2.219 | 5 | Anding Town | 1.392 | 12 |
| Huangcun Town | 2.111 | 6 | Lixian Town | 1.387 | 13 |
| Panggezhuang Town | 1.993 | 7 | Caiyu Town | 1.325 | 14 |

As for the evaluation standards for land comprehensive consolidation benefit in small towns, there is still no national standard or local standard. Therefore, evaluation standard in this research is determined based on questionnaire survey and expert consultation. For instance, comprehensive index greater than 3.350 shows that land comprehensive consolidation of

small town has obtained significant benefit; comprehensive index between 1.690 and 3.350 indicates that comprehensive consolidation benefit is good; comprehensive index between 1.390 and 1.690 indicates that comprehensive consolidation benefit is general; and comprehensive index smaller than 1.390 shows that comprehensive consolidation benefit is insignificant.

According to the evaluation standards for land comprehensive consolidation benefit of small town, land comprehensive consolidation benefits are sorted among 14 small towns in Daxing District. Result shows that areas having significant effects are Yizhuang Town, Xihongmen Town, Yinghai Town, and Jiugong Town. Areas having good effects are Changziying Town, Huangcun Town, Panggezhuang Town, Beizangcun Town, and Yufa Town. Areas having general effects are Weishan Town, Qingyundian Town, and Anding Town. Areas with no significant effects are Lixian Town and Caiyu Town.

Sorting result shows that areas with significant effects are concentrated in rural-urban continuum. Due to the radiation of urban development, rural-urban continuum has its location advantage, and has aggregated many hardware and software elements suitable for its development. Thus, these areas have significant advantages in both economic status and infrastructure status. Areas having good effects are mainly located along Yongding River. Due to the abundant farmland resources and good ecological environment, fruit trees and tourism have become the leading industries of areas along Yongding River. Weishanzhuang, Qingyundian Town, and Anding Town are relatively far from the city, having no significant location advantages. And their land comprehensive consolidation effects are general. Besides, due to the restriction of location, historical reasons, resources condition, and local social and economic development level, land intensive utilization ratio of Lixian Town and Caiyu Town are relatively low and their effects of land consolidation are insignificant.

## 4 Discussion

(1) Land comprehensive consolidation benefits of small towns in Daxing District are evaluated by a hierarchical index framework. Statistical data and information easy to be collected are selected. The clear index meanings, the compatible calculating standards, and the unified accounting methods have all ensured the scientific and rational comparative result. Accuracy of evaluation will be further improved under more perfect statistics and higher management level of information in small towns. And index system will more comprehensively reflect the benefits of land comprehensive consolidation in small towns.

(2) Analytic hierarchy process is adopted to determine the weight of index system. Benefit evaluation on land comprehensive consolidation is carried out by the comprehensive index method. Considering the various factors and their relationships, this research can objectively and accurately reflect the advantages and disadvantages of land comprehensive consolidation benefits in Daxing District, which provides objective references for the selection of land consolidation project in future.

## References

[1] XIE JQ. Sustainable land use system: indicators, evaluation and planning practice[D]. Beijing: China Agricultural University, 1999. (in Chinese).

[2] YAN JM, XIA SH, XIA CY. Analysis and evaluation of land consolidation benefits and the construction of index system[J]. Land and Resources Information, 2005(2):36 –42. (in Chinese).

(From page 50)

## References

[1] KEYNES JM. The general theory of employment, interest and money[M]. London: Macmillan Press, 1936:87 –104.

[2] DUESENBERRY JS. Income, saving and the theory of consumer behavior[M]. Cambridge, Mass: Harvard University Press, 1949: 45 –67.

[3] MODIGLIANI F. The life-cycle hypothesis of saving, the demand for wealth and the supply of capital[J]. Social Research, 1966, 33 (2):160 –217.

[4] FRIEDMAN M. A theory of the consumption function[J]. Princeton: Princeton University Press, 1957:220 –224.

[5] HALL RE. Stochastic implications of the life cycle-permanent income hypothesis: theory and evidence[J]. Journal of Political Economy, 1978, 86(6):971 –987.

[6] DEATON A. Saving and liquidity constraints[J]. Econometrica, 1991, 59(5):1221 –1248.

[7] CARROLL CD. The buffer-stock theory of saving: some macroeconomic evidence[J]. Brookings Papers on Economic Activity, 1992, 2:61 –156.

[8] CAMPBELL JY, GREGORY MANKIW N. The response of consumption to income: a cross-country investigation[J]. European Economic Review, 1991, 35:723 –767.

[9] QIN D. The relations between the residents' consumption and income[J]. Economic Research Journal, 1990(7):46 –49. (in Chinese).

[10] GENG TJ. An empirical test of stimulating consumption policy in China[J]. Quantitative and Technical Economics, 2004, 21(4):22 –25. (in Chinese).

[11] ZENG LH. Analysis of Chinese urban residents' consumption function——based on the data from 1978 to 2004[J]. Journal of Shanxi Finance and Economics University, 2006(6):46 –53. (in Chinese).

[12] ZHANG XY. Analysis of Chongqing urban residents' consumption function based on cointegration theory[J]. Journal of Chongqing Institute of Technology: Social Science, 2009(7):50 –52. (in Chinese).

[13] YIN SF. Empirical study on the consumption function model of rural residents in China[J]. Journal of Anhui Agricultural Sciences, 2009, 37(21):10153 –10155. (in Chinese).

[14] CHENG DW. Development path on small town in underdeveloped areas: A case of Ganzhou City in Jiangxi Province[J]. Asian Agricultural Research, 2009, 1(5):10 –15.

[15] CHANG K. Explore and analyse on the road landscape of the small town[J]. Journal of Anhui Agricultural Sciences, 2009, 37(36): 398 –399, 470. (in Chinese).

[16] MEI Y, XIAO X. Research on rural tourism development based on the new policy of land circulation[J]. Asian Agricultural Research, 2009, 1(5):19 –22.

[17] SUN XW. Analysis on the green space system planning in the small town[J]. Journal of Anhui Agricultural Sciences, 2009, 37 (36):454 –456. (in Chinese).