# Evaluation on Intensive Use of Rural Residential land:

# A Case Study of Suining County in Jiangsu Province

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**Abstract:** In this paper, an evaluation index system is developed for the intensive use of rural residential land from the aspects of land use intensity, input-intensity, arrangement, as well as usage efficiency. Using the entropy method, on which the intensive use level of rural residential land in Suining County is evaluated. The results are as follows: (1) The rural residential land use in Suining County is shifted from an extensive way towards an intensive way,but there is still a large room to improve.(2) The different of the intensive use level of rural residential land between different towns. On which some suggestions are put forward for improving the intensive use level of rural residential land.

## Introduction

With the accelerating urbanization process, rural residential areas have taken on a series of stage characteristics. The construction of rural residential areas in Jiangsu province is in a state of spontaneous disorder. The layout of rural settlements scattered, messy, seriously exceed the standard, the low efficiency of land utilization, become unbearable city construction and cultivated land protection problems[1]. Intensive use of rural residential land has become an important task of land management departments[2].

The concept of intensive land use was first proposed by classical economists such as Ricardo etc[3]. Late, researchers have studied many relevant issues of intensive land use. Among them, the research on rural residential land intensive utilization have changed from qualitative analysis to quantitative evaluation. It focuses on the evaluation index of land intensive use and constructs evaluation system. The evaluation methods include comprehensive evaluation method, grey relational analysis method, multiple nonlinear regression analysis method and analytic hierarchy process (AHP)[4].

In this paper, an evaluation index system is developed for the intensive use of rural residential land from the aspects of land use intensity, input-intensity, arrangement, as well as usage efficiency. Using the entropy method, on which the intensive use level of rural residential land in Suining County is evaluated. The purpose of this paper is to support the government to make scientific decisions and be a prototype of intensive use of rural residential land.

## Materials and methods

Methods

Entropy is objective weighting method, which works by calculating the entropy of information to the relative degree of change indicators as the basis to determine the weight coefficient. The basic

steps are as follows[5]:

(1) Data standardization

Entropy method is based on information load indicators to determine the size of the index weight. Based decision-making matrix is

$$D = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ x_{n1} & x_{n2} & \cdots & x_{nm} \end{pmatrix} \quad (1)$$

$x_{ij}$ is the *i*th index value of the *j*th index attribute.Calculate $p_{ij}$, it shows that under the same index, the proportion of the value of the participating object accounts for the sum of the value of all the participating objects. As the formula (2) shown.

$$P_{ij} = \frac{x_{ij}}{\sum_{i=1}^{n} x_{ij}} \quad (2)$$

(2) Calculate the entropy of the j-term indicator $e_j$.

$e_j$ represents the total amount of entropy contribution of all programs on the *j*th indicators, such as the formula (3) shown.

$$e_j = -k\sum_{i=1}^{n} P_{ij} \ln P_{ij} \quad (3)$$

Where the constant k generally take k = 1/lnn, so that can guarantee.

(3)Calculate the index difference coefficients $h_j$.

Difference coefficient $h_j$ indicates the extent of the inconsistency index contribution under the *j*th degree programs, as determined by $e_j$, as the formula (4) shown.

$$h_j = 1 - e_j \quad (4)$$

Obviously, $h_j$the greater the emphasis on the role of the project indicators.

(4) Determine intensive degree.

$Y_i$ indicates intensive use degree of rural residential land. Its range of value is [0,1], as the formula (5) shown.

$$Y_i = \sum_{j=1}^{m} \frac{h_j}{\sum_{j=1}^{m} h_j} P_{ij} \quad (5)$$

When $Y_i$=0, the land use of rural residential is in the primitive and extensive condition, and the intensive utilization of land is the lowest. When $Y_i$=1, the intensive use of land is the highest, so as to achieve the ideal state.

2.2. Evaluation index system and data source

In this paper, an evaluation index system is developed for the intensive use of rural residential land from the aspects of land use intensity, input-intensity, arrangement, as well as usage efficiency. On this basis, we selected these following 7 indicators to build up the evaluation system.

**Table 1 Rural residential land evaluation index system**

| Target level index | First level index | Sub-level index | Unit | Relevance |
|---|---|---|---|---|
| Intensive utilization level | land use intensity | per capita land use in rural residential areas（$X_1$) | Square meter/ person | negative |
| | | floor space（$X_2$) | ha | negative |
| | land input-intensity | medical service level（$X_3$） | person/ten thousand person | positive |
| | | infrastructure completeness（$X_4$) | ‰ | positive |
| | land arrangement | green area（$X_5$) | Square meter | positive |
| | | arable land area（$X_6$) | ha | negative |
| | Land use efficiency | per capita income（$X_7$） | ¥ | negative |

According to the principle of the comparability and scientific, the rural residential land data mainly comes from the land use change survey figures released by Xuzhou Bureau of Land and Resources. Other relevant social and economic data mainly come from Statistical yearbook of the Jiangsu Province.

## Results and discussion

results

Determine the intensive evaluation criteria

By comparing and analyzing the different evaluation standards at present, this paper adopts the 4 level evaluation standards. As shown in Table2.

**Table 2 The intensive evaluation criteria of rural residential land**

| intensive index | $Yi \geq 0.0084$ | $0.0056 \leq Yi \leq 0.0084$ | $0.0028 \leq Yi \leq 0.0056$ | $Yi \leq 0.0028$ |
|---|---|---|---|---|
| rating | Level I | Level II | Level III | Level IV |
| evaluation criteria | intensive | Common intensive | Don’t intensive | extensive |

Evaluation result

The intensive index and intensive grade of each town are different, and they are relatively large gap. As shown in Table 3.

**Table3 The intensive index and intensive grade of each town**

| town | intensive degree$Y_i$ | rating | town | intensive degree$Y_i$ | rating |
|---|---|---|---|---|---|
| Suicheng town | 0.0120 | IV | Shaji town | 0.0033 | III |
| Wangji town | 0.0026 | IV | Lingcheng town | 0.0060 | II |
| Shuanggou town | 0.0022 | IV | Qiuji town | 0.0019 | IV |
| Lanshan town | 0.0023 | IV | Gupi town | 0.0026 | IV |
| Liji town | 0.0083 | II | Yaoji town | 0.0012 | IV |
| Taoyuan town | 0.0017 | IV | Weiji town | 0.0008 | IV |
| Guanshan town | 0.0009 | IV | Liangji town | 0.0015 | IV |
| Gaozuo town | 0.0020 | IV | Anqing town | 0.0033 | III |

Discussion.

The intensive degree of rural residential areas needs to be improved

The rural residential land in all towns has not been intensively utilized. There are only two towns with secondary level of intensive land use, namely Lingcheng town and Liji town. The towns

of level three land intensive use are Shaji town and Anqing town. The remaining towns are of the level IV, with the minimum level of intensive use of Weiji town. The intensive degree of rural residential areas in Suining County needs to be improved. The main factors influencing the intensive use level of rural settlements in Suining County are the green area, the degree of infrastructure completion, the service level of each township medical institution, followed by the construction area, the cultivated land area and the per capital income.

The intensive degree of rural residential areas is obviously different.

The intensive degree of suicheng town is the highest , its comprehensive intensive index was 0.0120. The town is located in the regional center and main traffic arteries. Whether it is green areas, infrastructure facilities, or the level of medical institutions, such as the overall situation and layout of the distribution is relatively impressive. As the key development area of Suining county, it not only has a good natural and economic basis, but also attaches importance to the government's attention, investment and policy tilt, so that the intensive use of rural residential areas is relatively high. The concentrated utilization level of rural residential area in Weiji town is lowest, and the comprehensive intensive index is only 0.0008. The reason is that the infrastructure is in bad condition, that is, the traffic is not convenient, the infrastructure is low, the service level of the medical institutions is poor, the natural conditions are relatively bad, and the supervision is not in place, resulting in the scattered layout of the residential spots.

## Recommendations

Increase publicity and enhance legal awareness

To truly guarantee the quality and quantity of rural residential areas, optimize the implementation of the layout program, it must be universal participation. According to the survey, the local residents know little about the laws and regulations of land management, and the traditional ideas of the land management are serious. Faced with this situation, we must step up publicity, expand publicity channels, and ensure that everyone involved.

Improve the overall planning system of land use in villages and towns.

Through field investigation, it is found that the overall planning system of land use in Suining county is not perfect enough, and the planning of village level is very little. At this stage, in order to solve the problems such as the scattered distribution of rural residential areas in Suining County, the confusion of layout and the lag of rural infrastructure construction, we need to use overall planning under the guidance of reasonable planning of village planning and land use in Suining county rural land, fully respect the will, to ensure the feasibility of planning, formulate reasonable control standard and effective control measures.

Suit one's measures to local conditions

Because of the difference of each village of natural geographical environment, social and economic development, the quality of the village, customs and habits, we should follow the guidance of the principle of local conditions, respectively, optimize the layout of villages with characteristics. The most important thing is to create a good external and internal traffic environment for the rural agglomeration adjustment program, so as to form a good pattern of both rural characteristics and intensive use of land.

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