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# Effects of comprehensive land consolidation on land quality in hills and mountains

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## ABSTRACT

The research object of this paper is BiBei comprehensive land consolidation projects in Bishan County of Chongqing, analysis the land comprehensive consolidation impact on land quality in hills and mountains. The results show: (1) Through comprehensive improvement of rural land, land topography factors increase the value of 18.66%; Soil factors increase the value of 10.38%; Moisture factors comprehensive values improved7.88%; Landscape factors increase the value of 2.59%。(2) Overall, land quality integrated value is 1 before comprehensive improvement of rural land. Land quality integrated value is 1.395 after comprehensive improvement of rural land, improved by 39.5 %. Visible through the comprehensive improvement of rural land, land quality has increased in the study area, a good foundation for the sustainable development of agriculture.

## KEYWORDS

Land consolidation; Effects; Hills and mountains.



## INTRODUCTION

In recent years, under the principle of building a new socialist countryside guidance, Launched a number of projects to benefit farmers in chongqing. Such as land development and consolidation projects, low-yielding farmland, village project, the construction of a new socialist countryside, etc[1-3].

However, under the new rural construction, land consolidation as a carrier to promote the construction of a model village just started, less empirical research on it. To this end, explore comprehensive land management mode under the new countryside construction, improve the planning of democracy, scientific, feasibility is very important[4-6]. The research object of this paper is BiBei comprehensive land consolidation projects in Bishan County of Chongqing, analysis the land comprehensive consolidation impact on land quality in hills and mountains.

## MATERIALS AND METHODS

### The general situation of study area

The study area is located the Eight tang Town in Bishan County of Chongqing, the total area of 126.91 hm2. The area belongs to the subtropical humid monsoon climate, Rainfall, humid climate, with four distinct seasons. An average annual temperature of 18.3 ℃, average annual rainfall of 1231.2 mm, an average annual sunshine time is 911.5 hours ; an average annual frost-free period 337 days.

### Data sources

The original data mainly comes from BaTu town land use change survey data in 2012, BaTu town 2008 Statistical Yearbook, BaTu town comprehensive land consolidation planning (2008-2012), and the author's practical survey, use Bishan County Planning Bureau, trade and Economic Cooperation Bureau, agriculture bureau and other departments data for supplementary.

### Research methods

Learn from previous research results, combined with the actual situation of the study area, Establish evaluation indictor system of land quality in land improvement area (TABLE 1)[7]. In order to evaluate the impact of factors on agricultural production, using AHP to determine the weight of each evaluation factor weights (TABLE 2). In the evaluation system, for qualitative description of indicators, For all levels of evaluation factors were given scores ranging from 100 to 10(TABLE 3).

Comprehensive improvement in the status of rural land in the study area is the base, the quality index value of the default is 1 before land consolidation. Using the following formula standardization[8]:

$$F = X_i / X_j \quad (1)$$

Where: F is the value of i indexes after standardization, Xi is the value i indexes after the comprehensive improvement, Xj is the value i indexes before the comprehensive improvement. Normalized index value, F is greater than 1, indicates that the value of land quality indicators improved; F is equal to 1, indicating no change in the value of land quality indicators; F is less than 1, indicating that the lower value of land quality indicators.

Finally, we use the following formula to calculate the value of the land quality.

$$E = \sum_{i=1}^{n} F_i \times W_i \quad (2)$$

Where: Fi represent the standard value of i indicators, E represent comprehensive evaluation value of the land quality, Wi representatives weight of i indicators.

## EVALUATION RESULTS

based on In the field survey and data analysis, Land quality indicators for assignment and standardization, and assigned to the corresponding index weights, Finally, calculated the value of Land quality integrated and to compare them (TABLE 4).

The results show that: through comprehensive improvement of rural land, land topography factors increase the value of 18.66%. Among them, land flatness comprehensive values improved 10.24%, production convenient comprehensive values improved 2.88%, plots regularity

comprehensive values improved5.54%; Soil factors increase the value of 10.38%, among them, topsoil thickness comprehensive values improved4.39%, soil fertility levels comprehensive values improved5.99%, no change of land

utilization; Moisture Factors comprehensive values improved7.88%, Among them, water level of assurance comprehensive values improved2.91%, irrigation level of assurance comprehensive values improved3.89%, drainage level of assurance comprehensive values improved1.08%; Landscape factors increase the value of 2.59%, among them, landscape productivity comprehensive values improved0.76%, the beauty of the landscape comprehensive values improved1.83%。

**TABLE 1: Evaluation indictor system of land quality in land improvement area**

| Target layer | Guidelines layer | Index layer | Indexes and grading standards | rank |
|---|---|---|---|---|
| Effects of comprehensive land consolidation on land quality (A) | Topography factors (B1) | Land flatness C1 | Slope $<1^0$, high flatness | 1 |
| | | | Slope of $1^0$-$3^0$, relatively high flatness | 2 |
| | | | Slope of $3^0$-$5^0$, general flatness | 3 |
| | | | Slope $>5^0$, low flatness | 4 |
| | | Production convenient C2 | convenient | 1 |
| | | | not convenient | 2 |
| | | Plots regularity C3 | regularity | 1 |
| | | | not regularity | 2 |
| | | Topsoil thickness C4 | 25-40cm | 1 |
| | | | 15-25cm | 2 |
| | | | ＜15 cm | 3 |
| | Soil factors (B2) | Soil fertility levels C5 | fertile soil | 1 |
| | | | relatively High levels of soil fertility | 2 |
| | | | relatively Low levels of soil fertility | 3 |
| | | | poor soil | 4 |
| | | Land utilization C6 | ＞90%, high levels of Land utilization is | 1 |
| | | | 85%-90%, relatively high levels of land utilization | 2 |
| | | | 80%-85%, general land utilization | 3 |
| | | | ＜80%, relatively low levels of land utilization | 4 |
| | Moisture Factors (B3) | Water level of assurance C7 | adequate irrigation water | 1 |
| | | | limited irrigation water | 2 |
| | | | no irrigation water | 3 |
| | | Irrigation level of assurance C8 | irrigation guaranteed rate of more than 90% | 1 |
| | | | 75%-90% | 2 |
| | | | ＜75% | 3 |
| | | Drainage level of assurance C9 | a perfect drainage facilities | 1 |
| | | | drainage facilities in general | 2 |
| | | | 受淹 | |
| | | | poor drainage facilities | 3 |
| | Landscape factors (B4) | Landscape Productivity C10 | ＞1000kg | 1 |
| | | | 800-1000kg | 2 |
| | | | 600-800kg | 3 |
| | | | ＜600kg | 4 |
| | | The beauty of the landscape C11 | good | 1 |
| | | | common | 2 |
| | | | poor | 3 |

**TABLE 2 : C- A weight**

| | **B1** | **B1** | **B1** | **B1** | |
|---|---|---|---|---|---|
| | | | B-A weight | | |
| | 0.4031 | 0.2822 | 0.2177 | 0.097 | C-A weight |
| C1 | 0.5077 | | | | 0.2047 |
| C2 | 0.2861 | | | | 0.1153 |
| C3 | 0.2062 | | | | 0.0831 |
| C4 | | 0.3111 | | | 0.0878 |
| C5 | | 0.4246 | | | 0.1198 |
| C6 | | 0.2643 | | | 0.0746 |
| C7 | | | 0.5342 | | 0.1163 |
| C8 | | | 0.2684 | | 0.0584 |
| C9 | | | 0.1974 | | 0.0430 |
| C10 | | | | 0.6227 | 0.0604 |
| C11 | | | | 0.3773 | 0.0366 |

**TABLE 3: Factors score - level comparison table**

| | **100** | **90** | **80** | **70** | **60** | **50** | **40** | **30** | **20** | **10** |
|---|---|---|---|---|---|---|---|---|---|---|
| C1 | 1 | | 2 | | 3 | | 4 | | | |
| C2 | 1 | | 2 | | | | | | | |
| C3 | 1 | | | | 2 | | | | | |
| C4 | 1 | | 2 | | 3 | | | | | |
| C5 | 1 | | 2 | | 3 | | 4 | | | |
| C6 | 1 | | 2 | | 3 | | 4 | | | |
| C7 | 1 | | 2 | | 3 | | | | | |
| C8 | 1 | | 2 | | 3 | | | | | |
| C9 | 1 | | 2 | | 3 | | | | | |
| C10 | 1 | | 2 | | 3 | | 4 | | | |
| C11 | 1 | | 2 | | 3 | | | | | |

**TABLE 4 : The index standard value of land quality**

| **Index layer** | **After remediation** | **Before remediation** | **Standard scores** | **Comprehensive value of after remediation** | **Comprehensive value of before remediation** | **added value** |
|---|---|---|---|---|---|---|
| C1 | 60 | 90 | 1.50 | 0.2047 | 0.3071 | 0.1024 |
| C2 | 80 | 100 | 1.25 | 0.1153 | 0.1441 | 0.0288 |
| C3 | 60 | 100 | 1.67 | 0.0831 | 0.1385 | 0.0554 |
| 小▪ | — | — | — | 0.4031 | 0.5897 | 0.1866 |
| C4 | 60 | 90 | 1.50 | 0.0878 | 0.1317 | 0.0439 |
| C5 | 60 | 90 | 1.50 | 0.1198 | 0.1797 | 0.0599 |
| C6 | 100 | 100 | 1.00 | 0.0746 | 0.0746 | 0.0000 |
| 小▪ | — | — | — | 0.2822 | 0.3860 | 0.1038 |
| C7 | 80 | 100 | 1.25 | 0.1163 | 0.1454 | 0.0291 |
| C8 | 60 | 100 | 1.67 | 0.0584 | 0.0973 | 0.0389 |
| C9 | 80 | 100 | 1.25 | 0.0430 | 0.0538 | 0.0108 |
| 小▪ | — | — | — | 0.2177 | 0.2965 | 0.0788 |
| C10 | 80 | 90 | 1.13 | 0.0604 | 0.0680 | 0.0075 |
| C11 | 60 | 90 | 1.50 | 0.0366 | 0.0549 | 0.0183 |
| 小▪ | — | — | — | 0.0970 | 0.1229 | 0.0259 |
| total | — | — | — | 1.0000 | 1.3950 | 0.3950 |

Overall, Land quality integrated value is 1 before Comprehensive improvement of rural land, Land quality integrated value is 1.395 after Comprehensive improvement of rural land, improved by 39.5 %. Visible through the comprehensive improvement of rural land, land quality has increased in the study area, a good foundation for the sustainable development of agriculture. However, due to the qualitative evaluation described in more in the study, assignment method is more simple, there is a strong subjective and the result accuracy is not high. Future studies, can make use of mathematical methods and modern techniques, establish comprehensive land quality evaluation method more suitable for the comprehensive improvement of rural land.

## CONCLUSION

Comprehensive land consolidation is compatible outward expansion and connotations are two ways to tap the potential of land use, can effective supplement of arable land because building occupant, raise the level of intensive use of arable land, food security and ecological security. The research object of this paper is BiBei comprehensive land consolidation projects in Bishan County of Chongqing, analysis the land comprehensive consolidation impact on regional land quality. The conclusion is as follows:

(1) Through comprehensive improvement of rural land, land topography factors increase the value of 18.66%; Soil factors increase the value of 10.38%; Moisture factors comprehensive values improved7.88%; Landscape factors increase the value of 2.59%。

(2) Overall, land quality integrated value is 1 before comprehensive improvement of rural land, Land quality integrated value is 1.395 after comprehensive improvement of rural land, improved by 39.5 %. Visible through the comprehensive improvement of rural land, land quality has increased in the study area, a good foundation for the sustainable development of agriculture.

However, due to the qualitative evaluation described in more in the study, assignment method is more simple, there is a strong subjective and the result accuracy is not high. Future studies, can make use of mathematical methods and modern techniques, establish comprehensive land quality evaluation method more suitable for the comprehensive improvement of rural land.

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