

# Measurement Method and Influencing Factors of the Field Ridge Coefficient

Yulu Wei<sup>1, 2, 3, 4</sup>

<sup>1</sup>Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an 710075, China

<sup>2</sup>Shaanxi Provincial Land Consolidation Engineering Technology Research Center, Xi'an 710075, China

<sup>3</sup>Key Laboratory of Degraded and Unused Land Consolidation Engineering, the Ministry of Land and Resources, Xi'an 710075, China

<sup>4</sup>Shaanxi Provincial Land Engineering Construction Group Co., Ltd, Xi'an 710075, China

## Abstract

**This paper briefly introduced the concept, measurement method, influence factors and the influence of slope on the field ridge coefficient.**

## Keywords

**Ridge Coefficient; Sampling Points; Influence Factor.**

## 1. Introduction

As an important survey of national conditions and national strength, the purpose of the national land survey is to find out the whole country's land use situation, grasp the real land basic data, and implement information and network management of the survey results. Cultivated land is the most basic agricultural production resources and one of the most important basic data in the national land survey. An accurate grasp of the quantity and distribution of arable land in the country, an investigation of the status of basic farmland, and the mapping, registration and recording of basic farmland are the fundamental premise for the implementation of the strictest cultivated land protection system, and an important content for the supervision and assessment of the completion of the tasks and objectives of the protection of cultivated land and basic farmland in various regions and the guarantee of the national grain production capacity.

In field survey, the north width is greater than or equal to 2m, the south width is greater than or equal to 1m field ridge, earth ridge, etc., collectively referred to as field ridge[1]. The width of the field ridge refers to the width of the bottom of the field ridge, that is, the width of the field ridge. Ridges less than the above width are considered part of the cultivated land. Sillage coefficient refers to the ratio of sillage area to the cultivated land area in the cultivated land map spot area, and the cultivated land map spot area refers to the cultivated land area after deducting other lines and other areas that should be deducted.

## 2. Method of Measuring Tiankan Coefficient

### 2.1. Measuring Method

(1) Measurement on a large scale map. The width and length of field sills are measured one by one within the range of the selected sample points, and then the area value of all field sills is calculated, and then the total area of the selected sample points is measured on the drawing. The percentage of the ratio of the two is the field sills coefficient.

(2) Measurement on aerial film. The full digital photogrammetry system is used to directly measure the digital orthophoto (DOM) which has been preprocessed, edited, corrected and embedded. First, select the sample points on the aerial film, open the image image in the digital mapping module to enlarge to a certain multiple, measure the total area of the sample points and the area of each field ridge within the range, and then get the field ridge coefficient.

(3) Analytical calculation. The total station closure wire is arranged in the selected sample point range, or the global positioning system GPS RTK is used to measure the inflection point coordinates of the sample point range, and then the total sample point is calculated according to the vertex coordinates of the polygon. The area of all ridges within the range of sample points is calculated one by one, and the ratio of the two is the coefficient of ridges.

Finally, the average value of the field ridge coefficient of various points is taken as the deduction coefficient of the field ridge of this type of farmland.

## 2.2. Sampling Point And Sampling Area Selection Principle

Sample points refer to the typical cultivated land map spots selected in different geomorphic type zones and different ground slope grades for the purpose of measuring field slope coefficient [2]. Generally can be selected in the field, can also be selected indoors. In the field selection process, due to the wide field area and the limited field of vision, it is very difficult to select sites on the field. Therefore, the pre-selection sites can be carried out according to the collected data to avoid "blindness" in the field process, thus greatly improving the work efficiency.

In the process of selecting the sample area where the sample points are located, the following principles should be observed [3] :

- (1) The sample area must be spatially distributed reasonably and evenly distributed within the provincial administrative region.
- (2) The sample area must reflect the distribution characteristics of cultivated land in the province, crop planting characteristics, cultivation level, and have a typical.
- (3) The sample area must cover all grade levels at the provincial level.
- (4) The sample area must be able to represent the economic, various types of arable land, cultural characteristics of the whole province.
- (5) The sample area must cover the main types of geomorphology, soil and other factors in the province.
- (6) The sample area should be able to make full use of the existing DRG, DOM, DEM and other data in order to adopt more advanced investigation methods to improve the quality and efficiency of the investigation results.

## 3. Factors that Affect the Coefficient of Field

There are many factors that affect the field coefficient, including climate and precipitation, mother rock and soil, tillage level, topography and geomorphology[4].

### 3.1. Climate and Precipitation

Climate and precipitation affect the quality and yield of crops, the level of tillage, and thus affect the variation tendency of land class and the coefficient of land cover.

### 3.2. Mother Rock and Soil

A wide variety of sedimentary rocks, volcanic rocks and metamorphic rocks have become the mother rocks of soil development in the long-term development process of geological history. On hills and slopes, the rocks exposed to the surface develop into weathering crust due to weathering erosion. In basins, river valleys and low-lying areas, plains, rivers and terraces are

formed in these areas due to the accumulation of foreign sediment materials. The surface material is transformed into various types of soil by biological action, and different soil parent material has different effects on the field coefficient. Generally speaking, the parent rock contains more quartz particles. The soil permeability is good, but the viscosity is poor, so the field coefficient is larger, and vice versa.

### 3.3. Cultivation Level

Due to different geographical locations and the imbalance of economic development, the level of farming is also significantly different. The level of tillage also has different effects on the field coefficient. In the regions with more developed economy, high agricultural intensification and institutional production level, the land type map spots are relatively large, and the field margin coefficient is small, and vice versa.

### 3.4. Topography

Landform has great influence on the coefficient of landfall. Generally speaking, the coefficient of landfall in basin and valley is small, and that in hill and mountain is large.

## 4. Relationship between Slope and Slope Coefficient

Slope is a measure of the steepness of cultivated land. The steep slope not only directly restricts the degree of soil and water loss, but also affects the difficulty of agricultural mechanization and farmland infrastructure construction. It is generally believed that the gentle slope cultivated land less than  $3^\circ$  has no erosion hazard and has little influence on mechanization operation. If the slope is greater than or equal to  $3^\circ$ , all the influences will increase accordingly. Therefore, the slope has a great influence on the utilization of cultivated land. Due to the large scale of cultivated land, the rural roads and ditches are regular and the field ridges are small, and the coefficient of the ditches and ditches is smaller than that of the mountain areas.

At present, it is mainly through sampling measurement and statistical analysis of slope cultivated land of different slope terraces to obtain the variation law of field ridge coefficient and field ridge area, and then carry out regression analysis on the obtained field ridge coefficient of sample points and its slope value, so as to obtain the equation relationship between slope and field ridge coefficient. According to a large number of existing measurement data, the relationship between slope and slope coefficient can be summarized as follows:

(1) The greater the land slope, the greater the field slope coefficient, and the relationship between them reaches a significant positive correlation level.

(2) Soil slope coefficient is significantly correlated with ground slope, and the regression relationship is better than the comprehensive slope coefficient. However, the relationship between rocky slope coefficient and ground slope is not significant, which shows that soil has a masking effect on stone quality, so that the correlation between comprehensive slope coefficient and ground slope reaches a significant level. There are some differences between soil and stone field, the former coefficient is large, the latter coefficient is small, that is, soil field is wide, stone field is narrow, which is consistent with the reality.

(3) The field slope coefficient is closely related to the slope size of the field in addition to the ground slope and the texture of the field slope. In the case of the same ground slope, the slope of the field is negatively correlated with the slope coefficient. The larger the slope of the field, the smaller the slope coefficient.

(4) When the ground slope of the regression equation obtained from the sample points is flat slope or slight slope, the error of field slope coefficient is large.

## 5. Conclusion

Although the calculation of the field coefficient is only a small part of the national land survey work, it directly affects the cultivated land area, and cultivated land is an important content of ensuring national food security, safeguarding farmers' rights and interests, coordinating urban and rural development, and building a harmonious society, and is the top priority of the second national land survey. It can be seen that the importance of measuring the field ridge coefficient.

## References

- [1] Wang Ting, Chen Weiwei. Coefficient Calculation of Ridge between Fields in Land Survey[J].Jiangxi Coal Science & Technology, 2008(1):86-88.
- [2] Hao Xiaoliang, Chen Deng, Guo Shuhong. Key Problems in Calculation of Ridge between Fields in Land Survey[J].Scientific and Technology Management of Land and Resources, 2009, 26(4):81-85.
- [3] Liao Jianing. Study on the Mensuration About the Field Index of Province Cultivated Lan [J]. Modern Surveying and Mapping,2008, 31(5):38-40.
- [4] Li Wei. Research on new technology and method of calculating Tiankan coefficient [D]. Central South University,2009.