

Analysis on the Potential of Farmland Renovation of High-standard Farmland Construction Model Based on Regional Differences

Xin Yan, Rui Zhao

Land Surveying, planning and design Institute of Shaanxi Provincial Land Engineering, Construction Group CO., Ltd., Xi'an 710075, China

Abstract

Innovative building of high-standard fields plays an important role in solving the current practical problems faced by high-standard fields building and forming a scientific planning and maintenance building system. Based on the subjective and objective analysis of the demand for high-standard basic fields building and farmers' willingness survey, it is determined that the evaluation model based on the characteristics of high-standard basic fields building should be adopted in the analysis of agricultural land rehabilitate potential in the study area. At present, different departments, different scholars and organizations have different connotations and evaluation systems of cultivated land quality, which may affect the accurate understanding of regional cultivated land quality. At the same time, the prior evaluation and planning arrangement of high-standard fields building are mostly based on cultivated land patches as the evaluation decision-making unit, while the actual cultivated land consolidation is organized and implemented by administrative units, which may affect the practical application effect of high-standard fields building planning arrangement. Therefore, this paper expounds the innovative path of fields building by scientifically planning fields building, integrating existing resources, and implementing fine management, hoping to help solve the problems faced by current high-standard fields building and improve the level of high-standard fields building.

Keywords

High-standard fields, building model, fields rehabilitate, potential analysis.

1. Introduction

Analysis on the Potential of fields rehabilitate Based on Regional Differences of High-standard fields building Model Food security has been a global hot issue for a long time and even in the future. Especially at the beginning of 2008, the drastic fluctuation of world food prices led to social unrest in many low-income developing countries with food shortages and serious economic and political problems. China, as a developing country with a large population, relies on its own agricultural resources to achieve food self-sufficiency and balance between supply and demand, which is the basis for ensuring China's national security[1]. Nowadays, the state has paid more attention to the protection of agricultural land, and promulgated the agricultural fields protection policy. Among them, the building of high-standard basic fields and the improvement of agricultural land are the most important, which have promoted the development of modern agriculture and improved the sustainable utilization rate of land. Cultivated land protection has become a broad consensus. Cultivated land quantity is the basic guarantee of food security, and cultivated land quality is the key to food security. After paying attention to the protection of cultivated land quantity in the early stage, the protection and improvement of cultivated land quality and ecological environment have gradually been paid

attention to by the management decision-makers[2]. Comprehensive improvement of rural land has important practical significance for optimizing land use structure, effectively realizing cultivated land protection, promoting the overall development of urban and rural areas, and improving the level of economical and intensive land use in urban and rural areas. At present, there is no unified standard in the analysis of agricultural land rehabilitate potential in China, and the evaluation method is relatively simple, lacking scientific methods, which affects the effect of agricultural land rehabilitate. Therefore, it is of great significance to comprehensively analyze the potential of agricultural land rehabilitate and implement the rehabilitate mode according to local conditions.

High-standard fields building is a complex and comprehensive engineering building. In the concrete building, it is necessary to comprehensively consider various factors to ensure the scientific fields building and meet the regional planting demand. According to the connotation and main contents of land rehabilitate at present, the potential of land rehabilitate can be defined as: taking administrative, economic, legal and engineering measures in a certain period of time and under certain economic and technical conditions to increase the available land area and improve the potential of land utilization on the basis of improving the utilization rate of land resources. The ability to improve the ecological environment[3]. All localities have successively carried out the building of high-standard fields according to the requirements and connotations of concentrated contiguous land, high and stable yield, supporting facilities, stable form, good ecology and strong disaster resistance. However, in the process of building practice, there are also some problems of overall distribution and management, such as the mismatch between the endowment of cultivated land resources and capital investment, scattered investment, repeated building, difficulty in exerting comprehensive benefits, and light management of rebuilding. In view of this, it is of great practical significance to study the innovative path of high-standard fields building based on the building demand of high-standard fields and the agricultural planting demand of different regions.

2. Simple overview and significance of high-standard basic fields and land rehabilitate.

2.1. The concept of high-standard basic fields

High-standard basic fields is the basic fields formed in a certain period of time through rural land renovation and building, which is characterized by concentrated contiguous land, supporting facilities, high and stable yield, good ecology and strong disaster resistance, and is suitable for modern agricultural production and management. Including the original basic fields after rehabilitate and the basic fields after rehabilitate[4].

The building of high-standard basic fields is a kind of land rehabilitate activity, which aims at building high-standard basic fields and is carried out in key areas of rural land rehabilitate and major projects, basic fields protection areas and basic fields preparation areas according to the overall land use planning and land rehabilitate planning.

2.2. Importance of building of high-standard basic fields

The building of high-standard basic fields refers to the relevant regulations of the Ministry of Land and Resources. It is pointed out that the high-standard basic fields is the basic fields that is centralized and contiguous, stable and high in yield, strong in disaster resistance, does not damage the ecological environment and is suitable for agricultural production and management in a certain period of time[5]. On the premise of studying the conditions and characteristics of high-standard basic fields, the stability of high-standard and quasi-basic fields building is guaranteed, and its conditions include natural conditions, infrastructure conditions, location factors and ecological environment protection. For rural areas, the main economic

income comes from crop planting. How to increase the income of crops and use the existing land resources to improve the planting level of agricultural products plays an important role in increasing farmers' income.

2.3. The present situation of the building of high-standard basic fields

At present, the investigation and evaluation of agricultural land rehabilitate potential in high-standard basic fields areas is mainly based on quality potential. In the building of high-standard basic fields, the potential analysis of agricultural land rehabilitate mostly takes administrative villages as the investigation unit and townships as the summary unit, so as to divide the regional differences[6]. We should follow the principle of both drought and flood control, which can not only solve the irrigation problem encountered in drought, but also solve the problem of flood and drainage. Ensure to meet the needs of mechanized fields operations; In terms of modeling, it is necessary to ensure that fields is regular, there is a networked access path to fields, and the existing resources are used to construct high-standard fields. Especially for agricultural high-standard fields operations in some mountainous areas, it is difficult, requiring the support of manpower and equipment, and it is necessary to increase the investment standard for high-standard fields in order to meet the building requirements and other difficult conditions. As an item that people must take in every day. It is necessary to develop high-quality fields, and now the proportion of high-quality fields is relatively rare[7]. The specific value is shown in Figure 1:

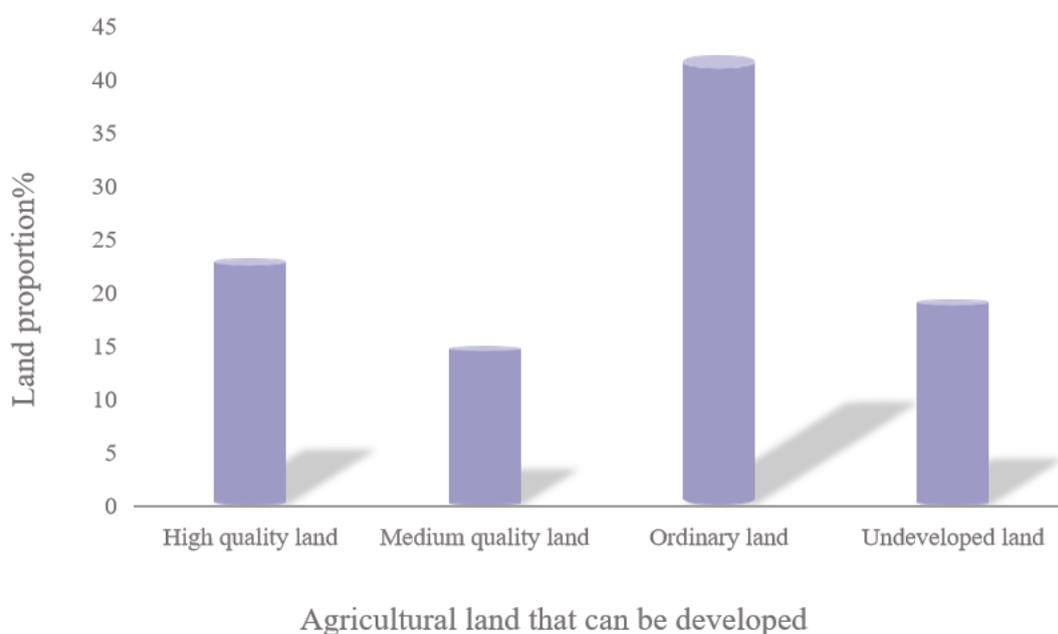


Figure 1 The proportion of each land that can be developed for agriculture is shown in the figure

As shown in Figure 1, the proportion of high-quality land development has not been taken seriously by people. Therefore, the purpose of building high-standard fields is to increase agricultural production and income. However, from the current high-standard fields building, there is a deviation between fields building and agricultural production, which leads to the emphasis on high-standard fields building and contempt for fields fertilization management[8]. Paying attention to the overall water conservancy project building, neglecting the field irrigation, etc., leads to the fact that the building of high-standard fields is only a project building, which has poor correlation with agricultural planting and production.

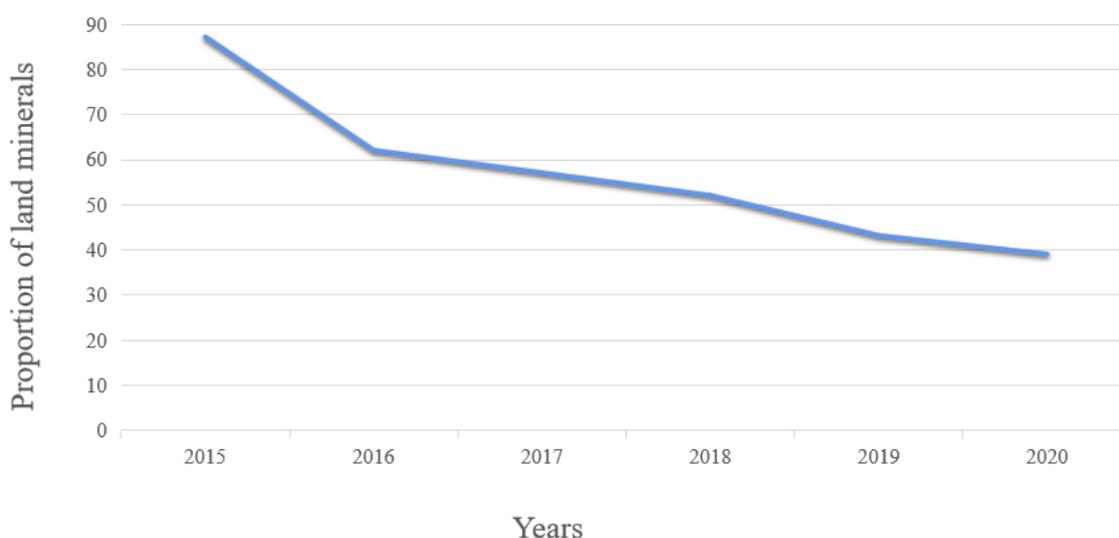


Figure 2 Land quality in 2015-2020

3. Potential analysis and suggestion discussion of agricultural land rehabilitate based on high-standard basic fields building mode

3.1. Conditions for the building of high-standard basic fields

The analysis of agricultural land rehabilitate potential of high-standard basic fields building model is based on specific regional empirical research. Its research idea is to divide the high-standard basic fields building area and non-building area within a certain regional scope, and divide the fields in non-building area into different investigation types according to the slope grade. According to the standard of high-standard fields, this paper considers that the building of high-standard fields should be carried out in areas with better site conditions, complete infrastructure and better location conditions. These areas can meet the requirements of high-standard fields with a little renovation. Land evaluation serves a specific purpose. Different historical periods and stages of human social development produce land evaluation with different purposes and different technical levels according to different land resource utilization levels, different demands and different development levels of science and technology. In the building of high-standard basic fields, the building contents include: land leveling, irrigation and drainage, field road building, fields protection, ecological environment protection, etc. In order to improve the quality of cultivated land and ensure the building level of fields infrastructure, we should optimize the land structure and layout, increase the area of effective cultivated land, improve the quality of basic fields, attach importance to ecological environment building, and promote the sustainable utilization of high-standard basic fields. Firstly, the grid is divided and coded, and the original data is pre-gridded. Secondly, the evaluation index system of cultivated land comprehensive quality is constructed. The grid is used as the evaluation unit program to calculate each index value, and the analytic hierarchy process (AHP) is used to give weight to each index. TOPSIS model is used to comprehensively evaluate cultivated land quality, that is, the priority of rehabilitate. Finally, the priority is analyzed by local clustering method.

3.2. Investigation on Quality Potential of High-standard Basic fields

Land rehabilitate embodies the subjective initiative of human intervention in land use in social practice. Its objectives and emphases are different in different countries and regions, but all of them are land use activities in the relationship of land ownership, realizing the rational adjustment of land use layout and the governance of land use problems, improving the

efficiency of land use, alleviating the contradiction between man and land, and realizing the sustainable development of economy, society, resources and ecology.

The factors that affect the potential of fields rehabilitate include land slope, distribution pattern of roads and ditches, sporadic land types and scale of fields, etc. Slope factor is the main influencing factor in fields rehabilitate. At the same time, it combines economic factors and local government's fields policy. This method has also attracted the attention of domestic scholars, and combined with the actual situation, it has been applied regionally to investigate the suitability of high-standard fields building[9]. Make use of the newly added building land and conditional building areas determined by the overall planning. The standard coefficient of cultivated land for land rehabilitate should be measured by sampling survey in areas where agricultural land rehabilitate has been carried out, which can increase cultivated land area, increase cultivated land coefficient, net cultivated land coefficient, etc. By calculating the confidence interval and average value of each slope grade, the standard coefficient of cultivated land for agricultural land rehabilitate in Changshou District can be determined according to the low, medium and high level values determined by the confidence interval. Usually, in the analysis of fields rehabilitate potential, the factors that affect the potential of land rehabilitate include: land slope, sporadic land types, fields and distribution of roads and ditches, etc. The quality of cultivated land in high-standard basic fields building areas is ideal.

Table 1 Ideal value of evaluation index for cultivated land quality potential in A type region

evaluating indicator	ideal value
Terrace rate	82
Surface slope	2
Slope mesa width	5
Cultivated layer thickness	35
Effective soil layer thickness	68
Suitable farming area ratio of small agricultural machinery	91
Concentrated contiguous scale of landscape patches	39

As shown in Table 1, the potential of newly-increased cultivated land with the same slope is limited, mainly because the quasi-net cultivated land coefficient in high-standard basic fields building areas is relatively large.

3.3. TOPSIS ranking method based on high-standard basic fields building

TOPSIS method ranks a limited number of evaluation objects according to their proximity to idealized goals, and it is a method of evaluating the relative merits of existing objects. TOPSIS method is a sort method which is close to the ideal solution. This method only requires that each utility function has monotonic increasing (or decreasing) property.

TOPSIS method is a commonly used and effective method in multi-objective decision analysis, also known as the distance method of superior and inferior solutions. Its basic principle is to sort by detecting the distance between the evaluated object and the optimal solution and the worst solution. If the evaluated object is closest to the optimal solution and farthest away from the worst solution, it is the best. Otherwise, it is not optimal. Among them, each index value of the optimal solution reaches the optimal value of each evaluation index. Each index value of the worst solution reaches the worst value of each evaluation index. It is best if the evaluation object is closest to the optimal solution and farthest away from the worst solution.

Construct a standardized evaluation matrix. Taking n regular grid units as the evaluation object set, each grid has m evaluation indexes, and the range normalization method is used to de-dimension each index, so as to realize numerical standardization and build a standardized evaluation matrix.

$$A = f_{11}, f_{12}, \dots, f_{1w} \tag{1}$$

Construct a weighted evaluation matrix B , the elements of which are:

$$z_{ij} = w_1 f_{ij} \tag{2}$$

B^+ and negative ideal solution B^- , namely:

$$B^+ = \{(\max z_{ij} | j \in J), (\min z_{ij} | j \in J), i = 1, 2, \dots, n\} = \{Z_1^-, Z_2^+, \dots, Z_m^+\} \tag{3}$$

$$B^- = \{(\min z_{ij} | j \in J), (\max z_{ij} | j \in J), i = 1, 2, \dots, n\} = \{Z_1^-, Z_2^-, \dots, Z_m^-\} \tag{4}$$

Calculate the distance from each network to the positive ideal solution S_i^+ , and to the negative ideal solution S_i^- , namely:

$$S_i^+ = \sqrt{\sum_{j=1}^m (z_{ij} - Z_j^+)^2} \tag{5}$$

$$S_i^- = \sqrt{\sum_{j=1}^m (z_{ij} - Z_j^-)^2} \tag{6}$$

Calculate the relative closeness degree of each network close to the ideal solution $C_i \in [0,1]$.

$$C_i = \frac{S_i^-}{S_i^+ + S_i^-} \tag{7}$$

Then the corresponding $C_i = 1$; If a grid coincides with the negative ideal solution, the corresponding $C_i = 0$.

3.4. Influence of TOPSIS ranking method based on high-standard basic fields building

In the building of high-standard basic fields, the potential analysis of agricultural land rehabilitate mostly takes administrative villages as investigation units and townships as summary units, so as to divide regional differences and analyze regional agricultural land rehabilitate potential, and the corresponding values and relationships can be obtained from 3.3. Calculate the average value and confidence interval of different slopes, and determine the fields rehabilitate potential of high-standard and non-high-standard basic fields, so as to promote the building of high-standard basic fields and rural economic growth in China. The building of high-standard fields includes many contents, which are hindered by many factors, such as capital and technology. In view of this, scientific management measures should be constructed from the following aspects to form a scientific fields management system[10]. We should attach importance to the building management of high-standard fields projects and formulate a scientific high-standard fields management mechanism. And organize relevant training work, so that grass-roots personnel can understand the maintenance methods of high-standard fields, so as to enhance the effect of fields maintenance and provide favorable conditions for promoting the effective improvement of the building benefits of high-standard fields.

4. Conclusion

China is in the decisive period of building a well-off society in an all-round way, and the rapid development of urbanization promotes the continuous expansion of land use demand. Agricultural land rehabilitation is carried out based on the high-standard basic fields building mode, and the centralized contiguous and regional building of fields is promoted. Because of the low ridge coefficient and slope grade of cultivated land in high-standard basic fields building areas, the potential of releasing cultivated land is limited, and its agricultural land rehabilitation presents the structural characteristics of mainly tapping the quality potential and supplemented by tapping the quantity potential. Because the quality of cultivated land outside the high-standard basic fields building area is relatively poor, and the distribution of fields is relatively scattered, the strategy of paying equal attention to the quantity and quality potential should be adopted in the agricultural land rehabilitation in this area. While improving the quality of cultivated land, it should be combined with the rural collective building land rehabilitation to increase the amount of effective cultivated land. The building of high-standard basic fields is a cause to promote China's social and economic development, promote China's overall economic promotion, ensure China's food security, and promote the sustainable development of social economy, which has important strategic significance.

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