

Benefit Evaluation of Land Reclamation Project of Abandoned Mine Land in Shenmu City

Lei Shi^{1, 2, 3, 4}

¹Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an 710075, China

²Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an 710075, China

³Key Laboratory of Degraded and Unused Land Consolidation Engineering, the Ministry of natural resources, Xi'an 710075, China

⁴Shaanxi Provincial Land Consolidation Engineering Technology Research Center, Xi'an 710075, China

Abstract

The reclamation and utilization of abandoned industrial and mining land is an important measure to implement the basic national policy of cherishing and rationally using land and strictly protecting cultivated land under the new situation, and to coordinate the development and protection of cultivated land. The pilot project for the reclamation and utilization of abandoned industrial and mining land left over from the history of Shenmu City is to implement the requirements of comprehensively implementing total resource utilization control, two-way adjustment of supply and demand, and differentiated management, standardizing the reclamation, adjustment and utilization of abandoned industrial and mining land, and effectively solving strategic resource development and urban development Land use bottleneck, optimize the structure of land use, improve the level of land conservation and intensive use, promote urban and rural coordination and sustainable economic and social development, and meet the demand for construction land under the background of rapid economic development.

Keywords

New cultivated land; Soil quality; Real time monitoring.

1. Project Description

The project area is located at the junction of the northern edge of the Loess Plateau in northern Shaanxi and the Mu Us Desert. The landform type belongs to the sandstorm project type area along the Great Wall of northern Shaanxi. The reclaimed areas are all idle industrial and mining waste land. The project involves Jiapi Village, Shigetai Village, Sanbula Village, Dingjiaqu Village, Houliuta Village and Temagou Village in Daliuta Town, a total of 6 administrative villages.

The terrain of Shenmu City is high in the northwest and low in the southeast. The main rivers flow into the Yellow River along the slope of the ground. The project area is located in the northern part of the city, belonging to the windy beach area along the Great Wall of Northern Shaanxi. The terrain is relatively flat and the altitude is between 987-1449.4 meters. The basement is the eroded loess Liangmao terrain, and the surface is undulating aeolian dunes (mostly quicksand and semi-fixed dunes), and depressions of varying sizes (also known as beaches) are formed between the dunes. The depressions are generally 5 square kilometers. Above, there are also tens of square kilometers, mostly grassland and agricultural land. The surrounding area is slightly inclined to the center, and the center and the edge of the beach

show a gentle slope transition, with a height difference of about 10-30 meters. The wet plants in the beach are dense, and the low-lying areas form swamps or water pools (commonly known as Haizi) due to the supply of groundwater and surface water.

The project area is located in the Fengshatan area. Due to the increase in vegetation coverage, the surface cover is mainly fixed aeolian sand soil. The dunes are smoother in appearance, undulating, and the surface crust thickens, the sand becomes tighter, and the soil has a micro-clump structure. The color becomes lighter from top to bottom, and there are more roots in the upper layer. Microbial activity is also more vigorous than microbial activity, organic matter and nutrient content has increased, and the profile differentiation is obvious.

According to "Agricultural Land Quality Grading Regulations" (GB/T 28407-2012), Shenmu County belongs to the Shaanxi Province agricultural land grading three-level indicator area "a windy and sandy area along the Great Wall of Northern Shaanxi", with a total of 6 designated crop grading factors, namely, effective soil thickness, surface soil texture, soil salinization degree, soil organic matter content, irrigation guarantee rate, and irrigation water source. The light-temperature productivity index of the designated crop spring corn is 2528, and the light-temperature productivity index of potato is 2414; the climate productivity index of spring corn is 1784, and the climate productivity index of potato is 1708; the yield ratio coefficient: spring corn (water irrigated land) 0.38, potato (irrigated land) 0.1; spring corn (dry land) 0.75, potato (dry land) 0.20.

2. Social Benefit Evaluation

(1) Quantitative analysis

1) Land utilization rate

The construction scale of the project is 78.9413hm². After the implementation, the newly increased cultivated land area is 20.8147hm², the newly increased grassland area is 11.2628hm², the newly increased woodland area is 7.0673hm², and the river water surface is restored 15.1111hm². The land utilization rate has been greatly improved after the project is reclaimed, and the land utilization rate has reached 100%.

2) Areas and corresponding proportions of newly added land types after reclamation

The main purpose of the current industrial and mining wasteland land reclamation project is to improve the ecological environment of industrial and mining areas, activate and rationally adjust construction land, and achieve the construction goals of protecting arable land, saving land, and optimizing the layout of construction land. After land reclamation and consolidation, the newly-added index area can effectively alleviate the problem of the shortage of newly-added construction land indexes and the contradiction between the supply and demand of construction land. After the implementation of this project, the effective arable land area can be increased by 20.8147hm², the newly increased arable land rate is 26.37%; the newly increased grassland area is 11.2628hm², and the newly increased grassland rate is 14.27%; the newly increased forest land area is 7.0673hm², and the newly increased forest land rate is 8.95%.

Rate of newly-added cultivated land = (newly-added cultivated land area / project construction scale) * 100%

That is: $(20.8147/78.9413)*100\%=26.37\%$

Rate of newly added grassland = (newly added grassland area / project construction scale) * 100%

That is: $(11.2628/78.9413)*100\%=14.27\%$

Newly added forest land rate = (newly added forest land area / project construction scale) * 100%

That is: $(7.0673/78.9413)*100\%=8.95\%$

3) Number of newly-added cultivated land available for support

The indicator of the number of newly-added cultivated land available for support is the main basis for measuring the degree of social security for farmers in the project area and a measure of the level of social benefits generated by the project. The number of new cultivated land available for support is 69 people.

Number of newly-added cultivated land available for support = newly-added cultivated land area / per capita cultivated land

That is: $(20.8147*15)/4.5=69$

4) Income level of farmers

The implementation of this project can improve the production and living conditions of farmers. The increase in per capita annual net income and the increase rate are the main indicators for measuring farmers' income and the social benefits generated by the project.

(2) Qualitative analysis

After the project is implemented, through the reclamation of abandoned industrial and mining land, the quality of the land can be improved, and the grain output can be increased, which will play a positive role in ensuring national food security.

The implementation of the project can absorb more labor force to engage in the agricultural industry, absorb part of the rural surplus labor force, and reduce the employment pressure in rural areas.

The implementation of the project added 20.8147hm² of cultivated land (312.22 acres), increased the per capita cultivated land area, provided conditions for stabilizing the social environment and alleviating rural employment problems, and also promoted the balance of the dynamic indicators of cultivated land in Shenmu City and maintained Shaanxi Province Contribute to the dynamic balance of the total arable land.

The implementation of the project will provide and accumulate experience for the local land reclamation of abandoned industrial and mining land; through land reclamation, the land parcels in the project area will be planned in a unified manner, and the newly added cultivated land can lay a good foundation for the construction of high-yield farmland, and will help in the future Realize the modern agricultural operation method of large-scale operation and mechanized operation, increase grain output and reduce agricultural production cost to a certain extent, and provide a model for large-scale agricultural production and operation in other regions. It is also an important measure of the country to ensure food security, so that the general people Be able to understand and support land consolidation work, so as to promote the comprehensive, long-term, in-depth and smooth development of land consolidation work [5].

3. Ecological Benefit Evaluation

(1) Quantitative analysis

The construction scale of the project area is 78.9413hm². After the implementation of the project, the newly increased grassland area is 11.2628hm², the newly increased woodland area is 7.0673hm², and the river water surface is restored to 15.1911hm², which improves the land reclamation rate to a certain extent. Land reclamation rate is an important indicator to measure land utilization rate.

Land reclamation rate after reclamation = (arable land area / total area of the project area) * 100%

Then: $(20.8147/79.9413)*100\%=26.37\%$

(2) Qualitative analysis

Through the reclamation of abandoned industrial and mining land left over from history, the reorganized plots are conducive to forest and grassland planting, and the plots are conducive to farming, further improving the ecological environment of the industrial and mining areas, and creating a convenient living and production environment for the local people.

The implementation of this project is to closely integrate the demolition project, land leveling project, irrigation and drainage project, and field road engineering under the premise of protecting the ecological environment. Through the implementation of the project, various restorations such as cultivated land, woodland and grassland have been completed. The task of reclamation direction optimizes the land structure and improves the land utilization rate and land quality. On the one hand, reclamation has greatly improved the quality of the cultivated land in the project area and the accessibility of roads, so that the ecological environment in the area has entered a virtuous circle, and gradually formed high-yield farmland; on the other hand, it has been carried out through the abandoned industrial and mining land left over by history. The construction of land leveling, field roads, farmland protection and ecological environment preservation projects, etc., has been reclaimed into woodland and grassland, which has changed the land use conditions and promoted the sustainable use of land resources. While improving the ecological environment of industrial and mining areas, it has also achieved The goal of restoring land use value.

The implementation of this project is based on the goal of "improving the ecological environment of industrial and mining areas, revitalizing and rationally adjusting construction land". After the project is completed, it will become a beautiful field landscape, playing the dual functions of agricultural production construction and beautifying the environment.

Through the construction of the project, the ecological landscape of the project area will be significantly improved, and a new path will be opened for the construction of a new socialist countryside.

4. Economic Benefit Analysis

After the abandoned industrial and mining land in the project area is reclaimed, an agricultural planting structure dominated by high-efficiency, high-yield and high-quality crops will be established. However, according to the existing farming habits, the main crops planted in the project area are spring corn.

a) Profit analysis

Before the implementation of the project, the area of arable land in the project area was 1.5765hm². After the implementation of the project, the area of newly increased arable land was 20.8147hm². The fields are flat, and the improvement of agricultural infrastructure will also increase the unit output of crops in the project area.

b) Annual net increase in economic benefits

Through the implementation of this project, the total benefit that can be increased annually in the project area is 464,800 yuan.

c) Project static investment payback period

The total investment of the project is 6,948,300 yuan. It is estimated that the annual net increase in economic benefits in the project area is 464,800 yuan.

The static payback period is used to calculate the payback period. The calculation formula is:

$$T=K/\Delta P$$

Where:

T—static payback period;

K—Total project investment;

ΔP —The economic benefit of net increase;

Calculated according to the above formula:

$T = 694.83 / 46.48 \approx 15$ (years)

Calculated by static investment recovery method, the investment recovery period is about 15 years.

d) Static rate of return on investment

Static rate of return on investment $= (\Delta P) / K = 46.48 / 694.83 = 6.69\%$

In summary, the ecological benefits of the implementation of this project are huge, the social benefits are obvious, and there are certain economic benefits, achieving the unity of social benefits, economic benefits and ecological benefits, which is in line with increasing industrial and mining wasteland land reclamation the goal.

5. Cultivated Land Quality Evaluation

The grading of the plots in the project area is carried out by the factor method, that is, the grading factors are determined (the grading factor indicators mainly include effective soil layer thickness, surface soil texture, soil salinization degree, soil organic matter content, irrigation guarantee rate, irrigation water source) On the basis of its weights, a multi-factor comprehensive analysis method is used to determine the natural quality scores of the designated crops in each grading unit, and the natural quality index of agricultural land is calculated according to the light temperature (climate) production potential, and the land use coefficient and land economic coefficient are calculated, To determine the agricultural land utilization index and the economic index, on this basis, the equidistant method is used to divide the natural quality, utilization and economic classification of cultivated land.

The national natural index of dry land cultivated land in Sanbula Village in the project area is 684, and the national natural index of irrigated land cultivated land in Shigetai Village is 1260. After calculation and index conversion, the two villages in the project area The national-level natural quality of cultivated land is 14 and 13 respectively, the national-level utilization is 14 and 13 respectively, and the national-level economy is 13-level.

References

- [1] Jiyuan L, Zengxiang Z, Xinliang X, et al. Spatial patterns and driving forces of land use change in China during the early 21st century[J]. Journal of Geographical Sciences, 2010, 20(4): 483-494.
- [2] Yang H, Li X. Cultivated land and food supply in China[J]. Land Use Policy, 2000, 17(2): 73-88.
- [3] Lin G C, Ho S P. China's land resources and land-use change : Insights from the 1996 land survey[J]. Land Use Policy, 2003, 20(2): 87-107.
- [4] Zhao B, Kreuter U P, Li B, et al. An ecosystem service value assessment of land-use change on Chongming Island, China[J]. Land Use Policy, 2004, 21(2): 139-148.
- [5] Yin H, Li C. Human impact on floods and flood disasters on the Yangtze River[J]. Geomorphology, 2001, 41(2): 105-109.
- [6] Zhang R, Pu L, Li J, et al. Landscape ecological security response to land use change in the tidal flat reclamation zone, China[J]. Environmental Monitoring and Assessment, 2016, 188(1): 1-10.

- [7] Poon C S, Yu A T, Jaillon L, et al. Reducing building waste at construction sites in Hong Kong[J]. Construction Management and Economics, 2004, 22(5): 461-470.
- [8] Li W, Ma Y, Guo C, et al. Occurrence and behavior of four of the most used sunscreen UV filters in a wastewater reclamation plant[J]. Water Research, 2007, 41(15): 3506-3512.
- [9] Li Q, Wu Z, Chu B, et al. Heavy metals in coastal wetland sediments of the Pearl River Estuary, China[J]. Environmental Pollution, 2007, 149(2): 158-164.
- [10] Wang W, Liu H, Li Y, et al. Development and management of land reclamation in China[J]. Ocean & Coastal Management, 2014: 415-425.