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The effect of high-efficiency water-saving irrigation measures on the quality of cultivated land

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Abstract

Cultivated land is an important resource to ensure food production and food security, and the level of cultivated land is a comprehensive reflection of the quality of cultivated land and grain production capacity. In this paper, through the implementation of high-efficiency water-saving irrigation projects, we explore its impact on cultivated land and other factors, in order to provide necessary reference for the improvement and protection of cultivated land quality.

Keywords

Cultivated land quality; Cultivated land classification; Grain productivity; Water-saving irrigation; Land consolidation.

1. Introduction

Cultivated land is an important resource to ensure food production and food security, and it is a clear requirement put forward by the Central Rural Work Conference to ensure that the quantity of cultivated land and the quality of cultivated land are not reduced. In recent years, my country has achieved world-renowned achievements in achieving sustained and steady growth in grain output. As a major grain producer and consumer, food security is the basic guarantee for maintaining my country's competition in the international community and social stability. At this stage, grain production capacity has become an important factor in comprehensively reflecting and evaluating the quality of cultivated land.The annual update evaluation results of arable land quality grades are also the basis for agricultural land grading and evaluation, especially when the revision method is used for agricultural land grading. The revision of the legal grading is based on the grading of cultivated land, and it is a method to comprehensively identify the grading of agricultural land by modifying the index of the mandatory factors and participating factors that have significant differences within the county and have a significant impact on the grading of agricultural land. The valuation of agricultural land is based on the grading and grading of agricultural land, for different grades or different homogeneous plots, and according to the different types of agricultural land use, the average price of a certain valuation period is assessed and determined.

According to the work deployment of the Ministry of Natural Resources, based on the annual update results of the quality of cultivated land, the country will gradually carry out the grading of cultivated land, the evaluation of agricultural land benchmark land prices and the construction of the publicity system. , to provide guarantee for the next step of agricultural land grading and appraisal work.

2. Project area overview

Lintong District is located in the east of Guanzhong Plain, Shaanxi Province, with Weinan in the east, Gaoling in the west, Lantian in the south, Yanliang in the north, and Sanyuan in the northwest. The geographic coordinates are 109°5'49"~109°7'50" east longitude and

34°16'49"~34°44'11" north latitude.The landform characteristics of the project area belong to the Weibei plain area, with open ground, deep soil layers and fertile soil. The soil characteristics are grayish-yellow, and the main soils are pseudo soil and loess soil. The altitude is between 350 and 370m. The climate of the project area is a continental warm temperate semi-arid monsoon climate, with four distinct seasons of cold, warm, dry and wet. The annual average temperature is 13.5℃, the extreme minimum temperature is -17℃, the extreme maximum temperature is 41.9℃, the maximum permafrost depth is 28cm, and the annual average rainfall is 575.82mm. , the rainfall has a strong seasonality, mostly concentrated in July, August and September. The average annual evaporation is 1035.7mm, the sunshine hours are 2154.7h, the monthly average relative humidity is 68.6%, and the average wind speed is 2.6m/s.The total amount of water resources in the project area has averaged 154.3 million m^3 for many years, including 40.29 million m^3 of surface water resources, 121.87 million m^3 of groundwater resources, and 7.86 million m^3 of repeated groundwater and surface water.

The technological innovation of agricultural production in the project area is weak. Due to the limitations of knowledge, information, and technology, most farmers cannot solve the introduction of new varieties and technologies by themselves. They have not made great strides in grain variety optimization, pest control, and mechanized farming, which limits the increase in income. ; Agricultural technology, the services that can be provided are far from the requirements of farmers, and it has become more and more unsuitable for the development of the situation; the degree of agricultural mechanization is low, and the production efficiency is not high. With the transfer of a large number of rural surplus labor force, the rural labor force is decreasing day by day. At present, most farmers still maintain the traditional simple production, with low production efficiency, heavy production burden and high cost for farmers.The three-scale data in the project area involves one first-level land category and two second-level land categories. The total area of arable land is 763.4746 hectares, including 760.9773 hectares of irrigated land and 2.4973 hectares of dry land.

3. Basic measures of the project areas

3.1. Current status of water conservancy projects

Water source project: There are 11 irrigation wells in the project area, of which the supporting wells are not perfect, so they cannot be used normally and can not give full play to their benefits.

The field works in the project area are mostly earth canals for water delivery, which takes a long time for irrigation and causes large leakage. Secondly, some channels are cultivated and cannot be irrigated. Most villagers use water hoses for irrigation, which is labor-intensive. Without the supporting buildings in the field, the normal use of the channel cannot be met, and the amount of water resources is wasted seriously. The roads in the fields are smooth but narrow, and machinery cannot enter into farming, which affects farmers' enthusiasm for farming.

3.2. Agricultural machinery and agricultural machinery service facilities

The street office where the project area is located has an agricultural machinery station with 8 staff, mainly including large and medium-sized tractors, agricultural trucks, irrigation and drainage power machinery, and combine harvesters. To meet the needs of agricultural modernization development in the project area.

3.3. Transportation and Electricity

The transportation of the project is very convenient, and the infrastructure such as electricity and communication is developed and complete. The main roads of the villages lead in all directions, and the village roads are directly connected with the Gaoyou Road, which provides

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extremely convenient transportation conditions for the implementation of the project. The power supply in the project area is sufficient, the power load is sufficient, and the power supply guarantee rate is high, which can meet the power consumption requirements of the project implementation and irrigation seasons.

3.4. Improvement measures for water-saving irrigation

Table 1 Construction content of high-standard farmland construction projects in Lintong District in 2019

Project	unit	design	finish	Completion rate
soil fertility	hectare	50.0000	500.0000	100%
agricultural well	seat	74	74	100%
Lining open channels (ditches)	kilometer	21.00	21.00	100%
canal building	indivual	60	60	100%
Tube irrigation (high-efficiency water-saving irrigation measures)	hectare	666.6667	666.6667	100%
Machine Cultivation Roads: Hardened Roads	kilometer	22.00	22.00	100%
Farmland Forest Network Project	meter	22000.00	22000.00	100%
low voltage transmission lines	kilometer	26.00	26.00	100%
Technical Training	visits	2000	2000	100%

4. Cultivated land classification method

According to the "Quality Grading Regulations for Agricultural Land" (GB/T 28407-2012), take the high-standard farmland construction project plots in Lintong District as the evaluation unit, organize and carry out the high-standard farmland project cultivated land classification evaluation work. The first is to analyze the basic situation of the research project area, find the index area of factors such as the county where the project area is located, as well as the standard farming system and designated crops, determine the light temperature (climate) production potential index, the maximum yield, yield ratio coefficient, and the maximum “yield— "Cost" index, grading factors and their weights, and scoring rules table for "specified crops - grading factors - natural quality points". The second is to calculate the natural quality score, land use coefficient and economic coefficient of the cultivated land in the project area, and calculate the natural index, utilization index and economic index according to the collected basic data such as project design report and soil testing analysis report, combined with field investigation. Divide the province's natural, etc., utilization, etc., and economy. The third is to use the Shaanxi Province equivalent index conversion coefficient to determine the national natural equivalent index, the utilization equivalent index, and the economic equivalent index, and to divide the national natural equivalent, national utilization, and national economy. Fourth, the area-weighted average method is used to calculate the national average utilization of cultivated land in the project area. Fifth, check and verify the evaluation results of cultivated land in the project area, finally determine the results of the project cultivated land classification, compile the cultivated land evaluation report of high-standard farmland projects in Lintong District,

establish a cultivated land evaluation database, and compile and plot the distribution of cultivated land classifications. picture.

5. Cultivated land quality grade assessment results

The total construction area of high-standard farmland in Lintong District is 1,040.1163 hectares, all of which are irrigated land.The grades of cultivated land in Lintong District are distributed in Yingkou Village, Sunzhao Village, and Xinmin Village. Among them, Xinmin Village has the largest cultivated land area of 6 grades, 416.0885 hectares; among all grades, 6 grades occupy the largest area, at 978.9243 hectares, and 7 grades have the largest area. The area occupied is the least, which is 61.1920 hectares; the area occupied by the level of cultivated land in Yingkou Village is the least, which is 204.3235 hectares.After water-saving irrigation and upgrading, the national natural grade of cultivated land in the project area is 7, with a total of 1,040.1163 hectares; the national utilization grade of arable land is 6 and 7, of which 978.9242 hectares of 6-grade land and 61.1920 hectares of 7-grade land; the national economic grade of arable land is 8, 9, etc., of which 997.0023 hectares are in the 8th grade, and 43.1140 hectares in the 9th grade.

6. Results and Recommendations

Before the implementation of the project area, the average national utilization rate was 7.0, and after the implementation, the average national utilization rate was 6.1, an average increase of 0.9. The newly added production capacity was 1.404 million kilograms.

The grading factors selected for the Weihe Plain in Guanzhong, where Lintong District is located, are: effective soil layer thickness, surface soil texture, soil salinization degree, soil organic matter content, drainage conditions, terrain slope, irrigation guarantee rate, and irrigation water source. Analyze the impact of high-standard farmland construction in the project area on these grading factors: existing projects have no impact on effective soil layer thickness, surface soil texture, soil salinization, terrain slope and drainage conditions; soil fertility and fertilizer have an impact on soil organic matter , but the impact is small; the supporting facilities of motor-driven wells, open channels and related canal buildings and the construction of high-efficiency water-saving irrigation have an impact on the irrigation guarantee rate and irrigation water sources. There is no change in the irrigation water source; through the rational allocation of irrigation water resources from the original water source and new workover wells, the irrigation guarantee rate in the project area can be improved from general satisfaction to basic satisfaction. Therefore, after the project area has passed the construction of high-standard farmland, the level of cultivated land has been improved.

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