

The Impact of High Standard Farmland Construction Projects on the Improvement of Farmland Quality

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Abstract

The People's Government of Shaanxi Province issued a notice on the issuance of the Implementation Plan for Accelerating the Construction of High Standard Farmland (Shaanxi Government Office [2020] No. 18), proposing to vigorously promote the construction of high standard farmland and lay a solid foundation for ensuring food security in the province. By 2022, the province will build 6 million acres of high standard farmland with centralized contiguous areas, drought and flood protection, efficient water-saving, stable and high yield, and ecological friendliness. Improving the quality of farmland through the construction of high standard farmland will become an important task in the new era.

Keywords

High Standard Farmland; Quality of Cultivated Land; Farmland Classification; Upgrade Path.

1. Introduction

The Central Committee of the Communist Party of China and the State Council attach great importance to the protection of arable land and the improvement of soil fertility, and firmly grasp the construction of high standard farmland to improve the construction standards and quality. In 2019, the "Opinions of the General Office of the State Council on Effectively Strengthening the Construction of High Standard Farmland to Enhance the National Food Security Guarantee Capacity" (Guo Ban Fa [2019] No. 50) pointed out that building high standard farmland is a key measure to consolidate and improve food production capacity and ensure national food security. The primary goal is to increase grain production capacity, highlight the protection of farmland, soil fertility improvement, and efficient water-saving irrigation, and vigorously promote the construction of high standard farmland, And include the newly added cultivated land indicators for high standard farmland construction in the supplementary cultivated land indicator database, which can be used for cross regional adjustment of cultivated land occupation and compensation balance while meeting the demand for this region's cultivated land occupation and compensation balance; In 2021, the 14th Five Year Plan and the 2035 long-term goal outline proposed to build 1.075 billion acres of concentrated and contiguous high standard farmland; The National High Standard Farmland Construction Plan (2021-2030) aims to build 1.2 billion acres of high standard farmland by 2030, with an increase of approximately 100 kilograms in per mu production capacity for newly increased standard farmland. In order to better implement the task of high standard farmland construction, in combination with the new requirements of farmland protection and productivity improvement, and in combination with the 2023 high standard farmland construction plan of Shaanxi Province, it is determined to implement high standard farmland construction in Xinxing Village, Chengguan Town, Qianyang County, and Liujiayuan Village, Zhangjiayuan Town. By improving farmland infrastructure, improving farmland quality, improving agricultural production conditions, and increasing food production capacity.

2. Overview of the Project Area

Chengguan Town is located in the south of the urban area of Qianyang County, bordering Cuijiatou Town in the east, Jiacun Town and Xiangong Town in Chencang District in the south, Shigou Town and Caobi Town in the west, and Zhangjiayuan Town and Nanzhai Town in the north. The maximum distance between east and west of the district is 10 kilometers, and the maximum distance between north and south is 16 kilometers, with a total area of 118.46 Square kilometre. Zhangjiayuan Town is located in the hilly plateau area, with high terrain in the north and low terrain in the south. The terrain is characterized by overlapping mountains and ravines in the north; The southern plateau is open and flat. The main peaks include Dawanling, Tiantai Mountain, and Miaoshan. The highest point in the territory, Dawanling, is located in Nanwanling Village, with an elevation of 1432 meters; The lowest point is located on the riverbank of Guanming Village, with an elevation of 740 meters. Qianyang County is located in the hilly and gully area in the west of Weibei Plateau, with complex and diverse terrain. Jianweiling, a tributary of Wuyue in Nanping, has an altitude of 1000-15021 meters, and a thousand mountains lie horizontally in the north, with an altitude of 1000-1545.5 meters. The total annual solar radiation is 112.8 kcal/square centimeter, the total annual sunshine hours are 2122.2 hours, the average annual temperature is 10.9 °C, the accumulated temperature ≥ 0 °C is 3583-4312 °C, and the active accumulated temperature ≥ 10 °C is 3462 °C. The average annual precipitation is 677.1 millimeters. The climate in the county varies greatly from north to south. The maximum temperature difference is 3.8 °C. The northern Qianshan hills are a warm and humid agricultural, forestry, and pastoral area, with an average annual temperature of 8.7 °C and an annual precipitation of 562.8 millimeters. The humidity is relatively low and the precipitation is also low. The locust buds in the high cliff area have almost no summer, and the thermal conditions are the worst. Central Sichuan was originally a warm and humid grain and oil production area, with an average annual temperature of 10.8-11.5 °C. The area around Shuigou has the highest temperature, with an average annual precipitation of 653.0 millimeters. The Jianwei Ridge in the southern rocky low mountains is a warm and humid agricultural and forestry area, with an average annual temperature of 10.2 °C and an annual precipitation of 700-751.4 millimeters from east to west.

3. Analysis of Project Construction Conditions

The main factors affecting project construction include infrastructure construction conditions, land use restrictions, and public participation. Among them, the infrastructure construction conditions are mainly analyzed from three aspects: transportation facilities, irrigation and drainage pipeline network facilities, and power facilities, to determine the current development and usage status of infrastructure in the project area; The limiting factors of land use are analyzed from the perspectives of natural limiting factors, agricultural facility limiting factors, and other limiting factors to determine the main factors that constrain the development of high standard farmland; The public participation is based on the will of the people and the essence of the project area construction. Starting from these three directions, analyze the current situation reasonably, identify problems, and find solutions, providing a solid basis for the later development and construction planning of high standard farmland.

3.1. Transportation Facilities

The external transportation conditions of the project area are relatively good, and the transportation is convenient and fast. The village level hardening is basically interconnected. The layout of some field roads is not reasonable, with curves and steep slopes, sharp bends, and narrow roads. The roadbed is of soil structure, with varying widths. Due to severe water flow

damage to the roadbed, many parts of the roadbed are uneven and the overall road is severely damaged, which is not conducive to agricultural machinery entering the field for operation.

3.2. Status of Field Irrigation and Drainage Facilities

The field irrigation facilities in the project area are incomplete, and there are relatively few supporting irrigation and drainage facilities in the field. Reasonable allocation of supporting irrigation and drainage facilities results in a low irrigation water utilization coefficient.

3.3. Project Area Restrictions

There are relatively few irrigation and drainage facilities in the field of the project area, and during the rainy season, the distribution of irrigation and drainage in each plot is uneven, with significant differences. Therefore, there is no reasonable matching of irrigation and drainage facilities. Due to continuous cropping, unreasonable irrigation, and heavy application of inorganic fertilizers, agricultural production in the project area has caused soil nutrient imbalance, nitrate accumulation, secondary salinization, significant acidification, damage to microbial populations, and accumulation of pesticide residues, resulting in a decrease in crop and vegetable yield and quality, seriously endangering people's physical health. For a long time, these factors have constrained the improvement of the comprehensive agricultural production capacity in the project area, as well as the improvement of land utilization and output rate in the project area, greatly affecting the production enthusiasm of local farmers. There is an urgent need to address obstacles through scientific planning and design, and improve the utilization and output rate of land in the project area.

4. Analysis of Arable Land Production Capacity

At present, the main problem of grain production in Qianyang County is the low land productivity. The reason for the low output is the low effective utilization rate of water resources, and the situation of both water shortage and waste. Whether water resources can be effectively used is the main problem that determines the increase of grain production in Qianyang County. It is the bottleneck to improve land productivity. If the effective utilization rate of water is increased by 10% -20% from the current level, there will be a very significant breakthrough in land production potential. Qianyang County will vigorously promote the construction of pipe irrigation projects in well irrigation areas to improve water use efficiency in accordance with the plan of high standard farmland construction projects; At the same time, efforts will be made to increase the construction of supporting facilities and water-saving renovation in irrigation areas. The mechanism of water-saving will follow the water management system of "total amount control, quota management, award and penalty reduction, association autonomy, government guidance, and public participation", establish water user associations, break through the solely relying on engineering water-saving mode, vigorously implement agricultural comprehensive water-saving, solve the problems of drinking "big pot water" and wasting water, and achieve the goal of saving water and reducing the burden on farmers.

Water conservancy is an important guarantee for food safety in Qianyang County. If we do not strengthen the construction of farmland water conservancy projects, it will lead to an intensification of water resource waste, low irrigation efficiency, failure to improve grain production, and farmers' inability to engage in diversified management, resulting in a lack of income improvement for farmers. Causing some pumping station equipment to be idle and causing serious waste of water resources, directly affecting the effectiveness of the project. At present, with the development of social economy and the adjustment of agricultural industrial structure, agricultural production has diversified, and limited water resources are particularly precious. Therefore, in order to make reasonable use of limited water resources, it is necessary

to vigorously develop the construction of farmland water conservancy projects, in order to ensure timely irrigation of agriculture, increase farmers' production and income, and promote social and economic development. Therefore, strengthening the construction of farmland water conservancy projects is the main means to improve food production.

5. Main Construction Content

5.1. Exploration and Restoration Engineering of Cultivated Land Quality

The general exploration project in the project area mainly involves investigating and collecting relevant natural, geographical, agricultural, economic, social and other information, and focuses on on-site exploration and sampling analysis of the soil foundation in the project area. Typical points are selected as fixed monitoring points to provide detailed basic data basis for project design. The cultivated land quality restoration project in the project area will focus on the low Soil organic matter and other problems found in the general exploration of the project area, and improve the Soil structure by using straw returning, adding Manure, deep soil reclamation, residual film recycling and other technologies, and improve the soil fertility by applying Manure, chemical fertilizer and microbial agents. After the completion of farmland quality restoration, the quality of farmland in the region shall be monitored and controlled for no less than three years. The improvement standard shall meet the requirements of Soil organic matter upgrading, and the biological Manure shall be applied at the standard of 100 kg/mu. All cultivated land in the project area has undergone land quality modification, with a restoration area of 5024 acres.

5.2. Irrigation and Drainage Engineering

The layout design idea of this irrigation project is to use the surface water around the project area to lift water to the regulating pool through a new pontoon pump station in the reservoir and then connect it to the low-pressure pipeline for gravity irrigation. According to the relative location of the irrigation area and the reservoir, geological conditions and changes in the water level of the reservoir, the station site is selected to prove the technical reliability and economic rationality of water intake in the reservoir area. The bank slope is stable, close to the irrigation area, convenient for water intake, and free from or less affected by sediment deposition. The location affected by freezing. The irrigation water intake pump station in the project area takes water from the Liujiayuan Reservoir. A float pump station is installed in the reservoir to lift the water to a high-level regulating tank, which is then connected to a low-pressure pipeline for self flow irrigation of farmland. One new pumping station will be built for the water source project, with a water transmission steel pipe of 1100m; One 300m³ regulating tank; The DN 110UPVC pipeline for field irrigation water distribution project is 10000m long. 50 gate valve wells, 50 drainage wells, 350 outlet piles, and 6 pressure reducing valves.

5.3. Field Road Engineering

Mainly harden the roads in various areas, and construct or renovate severely damaged and soil structured roads to facilitate the passage of agricultural machinery and meet the needs of farmers for transportation and production materials. Build a new 4m wide ecological cement road of 10000m.

6. Evaluation of Cultivated Land Quality and Analysis of Production Capacity

After implementing the general exploration and restoration project of farmland quality, irrigation and drainage project, field road project, and ecological environment restoration project, the quality of farmland in the project area can be improved by one grade after being

upgraded to irrigated land. Based on the increase of farmland by one grade, an additional grain production capacity of 100 kilograms will be added, and it is expected that an additional grain production capacity of 502 tons will be added after the implementation of the project.

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