Study on Soil Quality Improvement in Weibei Taiyuan District

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Abstract. In order to fully understand the spatial change characteristics of soil quality after land remediation in Weibei Taihe District, this paper takes Long County, Weibei Taihe District as an example, selects some project areas after land remediation, conducts soil nutrient testing, and studies the organic matter and nitrogen, phosphorus, and potassium in the soil. The distribution characteristics of soil and the quality of soil were graded. The scientific evaluation of the quality of newly cultivated land in the area after land remediation showed that, except for the organic matter content in the land remediation area of Dingma Village, other indicators and other The regional indicators are in compliance with the standards. According to the traditional fertility improvement methods, the soil organic matter content is lower than the standard. The organic matter can be improved by applying organic fertilizer and promoting the return of straw to the field. It is suggested that through the combination of cultivated land and cultivated land, crop rotation and stubble should be implemented to ensure balanced supply of nutrients to the newly-added cultivated land so that the development of cultivated land can achieve sustainable, stable and high yield.

1. Preface
With the development of society and economy, population density increases, people's production and living space is gradually crowded, and the demand for land is also increasing. Those difficult to use land undergo scientific and systematic remediation, change their original land types, and transform them into available land [1]. According to different people's needs, the goals of remediation of unused and difficult-to-use land are also different [2]. China is a country with a large population. Food security is the top priority of the country’s governance. While meeting the industrial land indicators required for economic development, it is also necessary to ensure the red line of arable land and the amount of arable land. It becomes more important to become new cultivated land. In order to scientifically assess and judge the quality of new cultivated land, the completed project area needs to be monitored and evaluated to ensure the quality of new cultivated land and ensure food production
while meeting economic development [3~5]. This article selects the typical agricultural county of Longbei, Longbei, Weibei as the research area, selects the newly-added cultivated land project in this county, tests the soil quality, and scientifically evaluates the newly-added cultivated land, in order to provide science for the newly-added cultivated land project guide.

2. Materials and methods

2.1. Overview of land remediation projects and sample collection
The study area is located in Long County, Baoji City. Based on the development of new farmland projects, 5 areas of Duanjiaxia, Shanchuan Village, Yaochang Village, Dingma Village and Pingtou Village were selected as sampling points. 5 points were randomly selected, and soil profile samples were collected layer by layer with an earth drill according to 0-10, 10-20, 20-40, 40-60, 60-80, 80-100cm, and 5 samples were sampled in the same soil layer. After mixing, reserve about 1 kg of soil sample according to the quarter method. The samples were air-dried and ground and passed through 2 mm, 1 mm, and 0.5 mm sieve holes for storage and testing.

2.2. Sample detection method
The pretreated samples were tested for nitrogen, phosphorus, potassium, and organic matter in the soil using Kjeldahl distillation, UV spectrometry, flame spectrometry, and potassium dichromate heating.

3. Results analysis

3.1. Impact of land improvement on soil organic matter and total nitrogen
As can be seen from the figure, the organic matter content in the soil in the five sampling areas is 4.98 to 6.13 g / kg. Except for Dingma Village, the organic matter content in the other areas is greater than 5.00 g / kg. The total nitrogen content in the soil in the five sampling areas is between 2.74 ~ 3.45g / kg, all of which are greater than 0.5g / kg. According to the "Quality Standards for New Cultivated Land in Weibei Taiyuan District," in the "Quality Standards for New Cultivated Land in Shaanxi Province Land Consolidation Project (Trial)" except for the low organic matter content in Dingma Village, the organic matter and total nitrogen content in other regions meet the standard.

![Fig. 1 Organic matter and total nitrogen content in different regions](image)
3.2. Effect of land improvement on available phosphorus and available potassium in soil

It can be seen from the figure that the available phosphorus content in the soil in the five sampling areas is 3.8 ~ 4.4 mg/kg, the effective phosphorus content in each area is greater than 3.00 mg/kg, and the available potassium content in the soil in the five sampling areas is 80 ~ 90 mg/kg, all greater than 50 mg/kg. According to the "Quality Standards for New Cultivated Land in Weibei Taiyuan District" in the "Quality Standards for New Cultivated Land in Shaanxi Province Land Consolidation Project (Trial)", the effective phosphorus and available potassium contents in all regions met the standards.

![Available phosphorus and available potassium content in different regions](image)

**Fig. 2** Available phosphorus and available potassium content in different regions

4. Results and analysis

Soil organic matter releases a large number of nutrients under the action of mineralization to provide nutrients for plant growth. Organic matter will synthesize humus under the action of humification and preserve nutrients, and humus releases nutrients again through mineralization, forming a nutrient cycling mechanism in the system, thereby ensure nutrient requirements throughout the plant growth process. Among them, humus is the main cement for the formation of soil aggregates, can promote the formation of good structures, and is an important indicator of soil fertility [6].

Nitrogen is an essential nutrient for plant growth. It is a component of every living cell. It is a component of many important organic compounds. These substances are involved in biochemical reactions such as genetic information transmission, organelle establishment, photosynthesis, and respiration. Nitrogen affects plant life activities. As well as crop yield and quality, they have an extremely important role. Plants need a lot of nitrogen to meet their growth needs. Nitrogen content is also one of the important indicators when evaluating the quality of newly added cultivated land [7].

Potassium is the main nutrient element of plants, and it is an activator of many enzymes, which can promote photosynthesis and carbohydrate synthesis and transportation. At the same time, potassium can promote protein synthesis, enhance the toughness of crop stalks, and improve drought and cold resistance of crops [8]. Therefore, potassium is also one of the important indicators in the evaluation of the quality of newly added arable land.
Phosphorus is second only to nitrogen and potassium in plants and generally higher in seeds. Phosphorus plays an important role in plant nutrition. Phosphorus participates in photosynthesis, sugar transportation, and protein synthesis. At the same time, phosphorus can promote respiration, release energy, and promote dry matter accumulation [9]. Phosphorus can also promote crop root development, enhance the ability of the root system to absorb water and nutrients, and the supply of phosphorus in the soil is an important guarantee for crop yield. Therefore, in the evaluation of the quality of newly added cultivated land, phosphorus should be analyzed as an important indicator [10].

By analyzing the nutrient content in the 5 project areas, except for the organic matter content in the land remediation area of Dingma Village, the other indicators of Dingma Village and other areas are in compliance with the standards. According to the traditional fertility improvement method, the soil organic matter content Below the standard, organic matter can be improved by applying organic fertilizer and promoting straw return to the field. It is suggested that through the combination of cultivated land and cultivated land, crop rotation and stubble should be implemented to ensure balanced supply of nutrients in the newly-added cultivated land, so that the development of cultivated land can achieve sustainable, stable and high yields.

The soil quality of newly-added cultivated land depends to a large extent on the background of soil quality before remediation. For project areas with better soil quality before remediation, the soil nutrient background value is relatively good after comprehensive land remediation and other engineering measures. The traditional fertility improvement mode is slightly modified to meet the needs of crop growth. For project areas with poor soil, low fertility, poor soil quality, and poor soil structure before the remediation, the soil organic restructuring theory should be fully applied during the remediation process, aiming at improving the soil structure, improving soil fertility, and ensuring plant nutrition Comprehensive biophysical, chemical, and biological restructuring measures are adopted in aspects such as bionutrition reconstruction, in order to achieve the goal of sustainable and stable improvement of soil quality. Different types of new cultivated land improvement types should be targeted with scientific, comprehensive measures by governant.

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