

Main technical measures for improving soil fertility through land consolidation

Lina Gou

Xianyang Branch of Shaanxi Provincial Land Engineering Construction Group Co.,Ltd., Xi 'an,
Shaanxi 712000, China

Abstract

In the implementation of agricultural comprehensive development projects and land consolidation projects, we vigorously promote the construction of high standard farmland with drought and flood protection. Through experiments such as using commercial organic fertilizers to plant green manure and returning straw to the field, we explore the main technical measures to improve soil fertility, in order to provide reference for improving soil fertility in flat areas.

Keywords

Land consolidation; Soil fertility; Enhancement measures; Land leveling.

1. Introduction

Improving soil fertility is of great significance for enhancing the comprehensive production capacity of grain and ensuring food security, and fertilization is the main measure to improve soil fertility. In recent years, PC County has vigorously implemented the construction of high standard farmland for comprehensive agricultural development. During the 12th Five Year Plan period, a total of 209 hectares of high standard farmland construction and 124 hectares of flat land have been completed. Although the "topsoil stripping method" is used for land leveling in the implementation of land leveling projects, for the excavation area, due to the fact that most of the soil is the bottom soil layer and the core soil layer, and for the filling area, most of the soil is the residual soil of the excavation section and the residual soil of the road and ditch excavation, there is uneven nutrient distribution and low fertility in the topsoil layer. In order to effectively restore soil fertility in these project areas as soon as possible, the main technical measures to improve soil fertility were explored through experiments such as applying commercial organic fertilizers, planting green manure, and returning straw to the field, in order to provide reference for improving soil fertility in flat areas.

2. Materials and Methods

2.1. Overview of the experimental area

The project area belongs to the subtropical monsoon humid climate zone, with obvious seasonal changes and significant differences between winter and summer. The average annual temperature is 17.7 °C, the precipitation is 1800~2000 mm, the average annual sunshine is 1900 hours, and the frost free period is about 244 days. The area is rich in solar and hot water resources, with great potential for crop light temperature and climate production. It is suitable for the production and increase of various crops, and the agricultural utilization is mainly based on single season rice.

2.2. Experimental Design

Implement commodity organic fertilizer for soil improvement, apply 200 kg of commodity organic fertilizer every 667m² as base fertilizer. Three fields totaling 20.67 hm² were selected in

the land engineering leveling area for winter planting of purple clover green manure. Master the process of green pressing from the beginning of flowering to the peak flowering period or 20 days before rice transplanting. Press 1500~2000kg of green pressing per 667m of rice field, and apply 30~50kg of lime for neutralization every 667m. In 2015, three plots totaling 24 hectares were selected in the land leveling area to implement rice straw crushing and returning. After harvesting rice and crushing straw, let it naturally decompose and return to the field. Before transplanting rice, irrigate and plow the field.

2.3. Survey sampling method

Compare the results of soil organic matter fixed-point determination before and after the implementation of technical measures. The collection of soil samples is carried out by selecting a hilly field block as the sampling field at each implementation site. Rectangular field blocks are sampled in an S-shaped manner, and square field blocks are sampled in a plum blossom shaped manner. Five sampling points are taken from each hilly field, with a sampling depth of 0-20cm. For mixed soil samples, it is advisable to take about 1kg of soil. Before and after implementation, soil samples were collected at the same location and on the same piece of land at different times. The collected samples were placed in a unified sample bag, labeled with a pencil, and one inside and one outside.

3. Results and Analysis

3.1. Apply commercial organic fertilizer

The results of fixed-point determination of soil organic matter before and after the use of commercial organic fertilizer in the land leveling area. The results showed that after applying organic fertilizer and cultivating rice for 1 year, the organic matter content of the surface soil in the leveling area increased to a certain extent, with an increase of 3.27%~23.57%. This indicates that the application of organic fertilizer has a certain effect on improving the fertility of the surface soil in the leveling area of high standard farmland.

3.2. Planting green manure

The results of fixed-point determination of soil organic matter in the land leveling area before planting and after 20 days of rolling of purple clover. The results showed that the organic matter content in the soil was significantly increased by 13.89% to 25.98% after planting and rolling purple clover. This indicates that green manure planting has a significant effect on improving and fertilizing the soil in the flat area.

3.3. Implement straw returning to the field

The results of fixed-point determination of soil organic matter before and after rice straw crushing and returning to the field in the land leveling area. After nearly 200 days of autumn, winter, and spring, the crushed rice straw has partially decomposed and the decomposed organic matter has entered the soil surface. From Table 3, it can be seen that after implementing the return of rice straw to the field, the organic matter in the surface soil has increased to a certain extent, with an increase of 5.19% to 11.29%, thus achieving the effect of fertilizing the soil. If straw is crushed and then plowed, the mixing effect between straw and soil should be better, but plowing is expensive and has not been adopted in actual production.

4. Summary and Discussion

The application of organic fertilizers has a long history in China. Long term application of organic fertilizers can increase soil total nitrogen and organic carbon content, reduce phosphorus fixation loss, delay the depletion of available potassium in soil, and ensure

sustained nutrient supply. Long term application of organic fertilizers can also improve soil physical indicators, reduce soil bulk density by 4.0% to 6.6%, and increase soil total porosity by 4.0% to 6.9%. Yan Zhilei's research shows that the number of fungi and actinomycetes in the soil of purple clover increases after years of rolling, and the activities of soil enzymes such as catalase, invertase, urease, and acid phosphatase are enhanced. Returning straw to the field can increase soil moisture and soil temperature, increase soil organic matter, enhance nitrogen fixing bacterial activity, promote the formation of soil aggregates, and thus improve soil biological characteristics. The results of soil fixed-point monitoring in this study showed that the application of organic fertilizer, winter planting of green manure, and rice straw crushing and returning to the field can all increase soil organic matter content, thereby achieving the effect of fertilizing soil and restoring soil fertility. Among them, the planting of green manure and purple clover technology has the highest increase in soil organic matter and the best effect. However, in the specific implementation process of planting purple loosestrife, it is necessary to strengthen drainage, open three ditches, and apply a certain amount of calcium magnesium phosphate fertilizer in order for purple loosestrife to grow vigorously and achieve a certain yield. Otherwise, due to waterlogging, the purple loosestrife seedlings will wither and even die. The application of a certain amount of calcium magnesium phosphate fertilizer can promote the growth of *Ganoderma lucidum* and increase the fresh grass yield of *Ganoderma lucidum*.

References

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