

Soil Nutrient Analysis of High Standard Farmland Construction in Fengxiang Area

Lu Zhang^{1,2,3,4,5}

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

²Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an Shaanxi, 710021, China

³Key Laboratory of Degraded and Unused Land Consolidation Engineering, Ministry of Natural Resources, Xi'an Shaanxi, 710021, China

⁴Shaanxi Engineering Research Center of Land Consolidation, Xi'an Shaanxi, 710021, China

⁵Land Engineering Technology Innovation Center, Ministry of Natural Resources, Xi'an Shaanxi, 710021, China

Abstract

In order to ensure China's grain output and food security, we should upgrade the grade of farmland, increase farmers' income, and realize the storage of grain in the land and the storage of grain in technology. While promoting the planning tasks of high-standard farmland construction projects issued by the state and Shaanxi Province, through the determination of soil nutrient indicators in the proposed high-standard farmland area in Fengxiang District, it is pointed out that the average content of soil organic matter in the study area was 12.18 g/kg, which was relatively insufficient as a whole; the average content of soil available nitrogen was 149.45 mg/kg, which was relatively abundant as a whole; the average content of soil available phosphorus was 8.94 mg/kg, which was also relatively insufficient as a whole; and the average content of soil available potassium was 124.82 mg/kg. The whole is moderate. To sum up, after appropriately increasing the content of organic matter and phosphorus, the newly built high-standard farmland can meet the demand for soil nutrients for food crop growth and meet the requirements of high-standard farmland construction in Northwest China.

Keywords

High-standard Farmland; Oil Available Nitrogen; Soil Available Phosphorus; Soil Available Potassium.

1. Introduction

Cultivated land is the "lifeblood" of grain, and the coordinated development of quantity and quality is related to China's food security and social stability [1]. High-standard farmland construction is a key measure to consolidate and improve grain production capacity and ensure national food security [2]. The construction of high-standard farmland has appeared in the central No. 1 document for more than 10 consecutive years. As early as 2005, some major grant-producing provinces in Sichuan carried out the "fertile soil project". In 2014, the Central No. 1 document proposed the implementation of the national master plan for high-standard farmland construction. In 2016, the Central No. 1 document proposed to promote the construction of high-standard farmland on a large scale. On November 21, 2019, The General Office of the State Council issued the Opinions on Effectively Strengthening the Construction of High-Standard Farmland to Enhance the National Food Security Capability, proposing that by 2022, the

country should build 1 billion mu of high-standard farmland, and the construction of high-standard farmland will be included in the assessment content of the cultivated land protection responsibility of local governments at all levels. On November 2, 2021, The State Council approved the "National High-Standard Farmland Construction Plan (2021-2030)" (hereinafter referred to as the "Plan") by the "State Letter (No. 202186)". The "Plan" focuses on the grain production target, defines the overall requirements, construction standards and construction content, construction zones and construction tasks, construction supervision and follow-up management and protection, benefit analysis, implementation guarantee, etc., and provides an important basis for the scientific and orderly development of high-standard farmland in various regions.

On February 24, 2022, the Ministry of Agriculture and Rural Affairs issued a notice on the task of farmland construction in 2022, requiring the national plan to build 100 million mu of high-standard farmland and coordinate the development of 15 million mu of efficient water-saving irrigation in 2022, of which 3 million mu of high-standard farmland and 700,000 mu of efficient water-saving irrigation area in Shaanxi Province [3]. On November 14, 2022, the General Office of the Shaanxi Provincial People's Government issued a notice of action plan to accelerate the construction of high-standard farmland, which pointed out that by 2025, the province will build 21.94 million mu of high-standard farmland, upgrade 1.14 million mu, and achieve full coverage of major grain-producing counties. The planned task of the 3 million mu farmland construction project in Fengxiang District in 2022 is 83,000 mu [4]. According to statistics, in 2021, the grain sown area of Fengxiang District will be 832,000 mu, among which the wheat sown area will be 627,500 mu and the corn sown area will be 179,900 mu, and the wheat and corn sown area will account for 96.94% of the total grain sown area of Fengxiang District. Total grain production was 290,000 tons, an increase of 2.4% over the previous year [5]. Fengxiang area has a good grain planting foundation. Therefore, it is necessary to find out the soil texture, salt status, acid-base degree and nutrient benefit of the high-standard farmland area to be built in this area, so as to provide a scientific basis for the smooth construction of high-standard farmland, and improve the quality of cultivated land and grain production capacity through targeted suggestions and measures.

2. Materials and Methods

2.1. Overview of the Study Area

Fengxiang District, located in Baoji City, Shaanxi Province, is located in the west of Guanzhong Plain, the northeast of Baoji City, the city is 44 km away from the central city of Baoji. The east and west of Fengxiang District are Qishan County and Qianyang County respectively, and the north and south are Chencang District and Linyou County respectively. The area is 1179 km². Fengxiang is located in the compound position of Qinling latitudinal, Qilu He Mountain front and Shaanxi spiral structural system. The topography is complex and diverse, including mountains, rivers, terraces, gullies and gullies. In the north, the low mountain hills and hilly gully areas have undulating mountains, gullies and ravines, the main gully system is open, the slope is gentle, mostly in 15 ~ 20 degrees, and the natural vegetation is superior to the highland area. The southern Sichuan Highland is flat with an elevation of 750 ~ 950 m and fertile soil. Fengxiang District is a warm temperate continental monsoon climate area, semi-humid and semi-arid. The average annual temperature is 11.4 degrees, and the precipitation is 790 mm. The rainfall is mainly concentrated in July, August and September, and the frost-free period is 209 days. The main aquifers of groundwater are sand, gravel and stone layers. The thickness of the water layer is 18.6 ~ 26.38 m, which gradually becomes thinner from south to north. Shallow water and shallow confined water are mined. The depth of water level in the burial zone is 20 ~ 40 m, and the water salinity is less than 1 g/L. There are four distinct seasons

throughout the year, winter and summer are long and spring and autumn are short, and rain and heat are in the same season, which is conducive to crop growth. However, in the growing season of crops, the solar radiation is strong, the temperature and precipitation vary greatly from year to year, and drought is easy to occur.

2.2. Experimental Design

In order to better implement the task of high-standard farmland construction, combined with the high-standard farmland construction plan of Shaanxi Province in 2022, Determine the implementation of high standard farmland in 10 villages in Liulin Town, Chencun Town and Changqing Town: Beidoufang Village (BDF), Caiyangshan Village (CYS), Dongwutou Village (DWT), Yidi Village (LD), Luobasi Village (LBS), Pangjiji Village (PJW), Shangying Village (SY), Shitou Village (STP), Xijie Village (XJ) and Zijing Village (ZJ) Construction of general exploration, a total of 28,300 mu. Five surface soil samples (0 ~ 20 cm) were randomly collected from wheat fields in each village, and the measured results were averaged.

Soil organic matter was heated in oil bath -K₂Cr₂O₇ capacity method, soil available nitrogen was determined by semi-micro Kjeldahl method, soil available phosphorus was used by 0.5 mol/L NaHCO₃ extraction - molybdenum-antimony resistance colorimetric method, and soil available potassium was used by 1 mol/L neutral CH₃CoonH₄-flame photometry method.

Using DPS 7.05 software, Duncan's new complex range method was used for statistical analysis of the data.

3. Results and Analysis

Table 1 shows the soil nutrients of high-standard farmland plots to be built in Fengxiang area. As can be seen from Table 1, the content of soil organic matter in the study area ranges from 8.73 g/kg to 14.65 g/kg, with an average content of 12.18 g/kg, and the content of available nitrogen ranges from 114.82 mg/kg to 211.06 mg/kg, with an average content of 149.45 mg/kg. The available phosphorus content ranged from 2.63 mg/kg to 15.76 mg/kg with an average content of 8.94 mg/kg, and the available potassium content ranged from 100.80 mg/kg to 157.26 mg/kg with an average content of 124.82 mg/kg.

Table 1. Soil nutrient content of areas to be built with high standard farmland in Fengxiang

Village	Organic matter /g·kg ⁻¹	Available nitrogen /mg·kg ⁻¹	Available phosphorus /mg·kg ⁻¹	Quick available potassium /mg· kg ⁻¹
BDF	14.65±1.1431a	125.83±3.2617ef	15.76±1.2445a	157.26±3.7071a
CYS	14.13±1.2740a	176.26±5.3891b	13.27±0.8595bc	135.14±3.5409b
DWT	12.26±1.3486ab	138.94±5.3103de	11.20±0.4057bc	126.94±2.9581c
LD	9.41±1.0330cd	114.82±2.7279g	4.95±1.4110d	102.94±3.2594e
LBS	10.58±1.2008bcd	129.55±3.8874ef	5.90±0.6419d	100.80±3.2347e
PJW	11.94±0.9407abc	211.06±4.4011a	6.92±0.4819d	116.38±2.2027d
SY	13.64±1.2334a	131.95±3.4624de	6.19±1.1004d	134.67±3.2158b
STP	8.73±1.0247d	159.33±3.9910c	2.63±0.4415e	107.67±5.6960e
XJ	13.39±1.5139a	184.13±3.4560b	10.75±1.2259c	126.26±3.6324c
ZJ	13.06±1.2251ab	122.60±2.0888fg	11.78±1.2417bc	140.11±3.4327b

The organic matter content in the study area was the highest in Beidoufang Village and the lowest in Shitopo village, which was 40.37% lower than that in Beidoufang Village, Caiyangshan

Village, Shangying Village and Xijie village. The organic matter content in Shitopo Village was significantly different from that in Beidoufang Village, Caiyangshan Village, Shangying Village and Xijie village at Duncan's new complex range method ($P < 0.05$). The soil available nitrogen content was the highest in Pangjijia Village and the lowest in Yidi village, relatively lower by 45.60%. The soil available nitrogen content in Yidi village, Pangjijia Village and Shitopo village was significantly different at the Duncan's new complex range method ($P < 0.05$) level. The soil available phosphorus content was the highest in Beidoufang village and the lowest in Shitopo village, which was relatively lower by 83.33%. The soil available phosphorus content in Beidoufang Village, Shitopo Village and Xijie Village was significantly different at Duncan's new complex range method ($P < 0.05$) level. The soil available potassium content was the highest in Beidoufang village and the lowest in Luobasi village, which was relatively lower by 35.9%. The soil available potassium content between Beidoufang Village and Zijing Village was significantly different at Duncan's new complex range method ($P < 0.05$) level.

4. Conclusion

According to this study, the content of soil organic matter in the study area ranged from 8.73 g/kg to 14.65 g/kg, and available phosphorus ranged from 2.63 mg/kg to 15.76 mg/kg, all of which were relatively insufficient. The content of available potassium in soil ranged from 100.80 mg/kg to 157.26 mg/kg, which was moderate overall. The content of soil available nitrogen ranged from 114.82 mg/kg to 211.06 mg/kg, which was relatively abundant. The overall lack. By appropriately increasing the content of organic matter and phosphorus, the newly built high-standard farmland can meet the demand of soil nutrients for food crop growth.

References

- [1] YU Fawen, WANG Guangliang, LIN Shan. Key Issues and Path Selections of Agricultural Green Development in Main Grain Producing Areas[J]. Chongqing Social Sciences, 2022, (7):6-18.
- [2] HAO Shuai, WANG Guogang, YANG YanTao, Han Chengji, Zhang HuanHuan. Research Tracking and Future Prospects of Well-facilitated Farmland Construction[J]. Chinese Journal of Agricultural Resources and Regional Planning, 2023-01-17.
- [3] Farmland construction department. Notice of the Ministry of Agriculture and Rural Affairs on assigning farmland construction tasks in 2022[EB/OL]. http://www.ntjss.moa.gov.cn/zcfb/202202/t20220224_6389541.htm, 2022-02-24/2023-02-01.
- [4] Shaanxi Provincial Government General Office. Notice of the General Office of the Shaanxi Provincial People's Government on Printing and Distributing the Action Plan for Accelerating the Construction of High-Standard Farmland [EB/OL]. http://www.shaanxi.gov.cn/zfxxgk/fdzdgknr/zcwj/nszfbgtwj/szbh/202211/t20221116_2264911.html, 2022-11-14/2023-02-01.
- [5] Bureau of Statistics of Fengxiang District, Baoji City. National economic and social development of Fengxiang District, Baoji City in 2021[EB/OL]. <http://tjj.baoji.gov.c>, 2022-05-12/2023-01-31.