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Study on the Impact of Land Consolidation Project on Soil Quality in Bainijing Town, Dingbian County

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Abstract. Taking Bainijing Town, Dingbian County, Shaanxi Province as an example, the nutrient characteristics and physical and chemical properties of soil samples were studied and analyzed. The results showed that the soil pH of D001 and D002 samples was the highest (9.7), the total amount of water soluble salts of D002 samples was the highest (0.5 g kg⁻¹), and the soil conductivity of D001 samples was the highest (15.8 mS m⁻¹). The highest content of soil organic matter was 9.52 mg kg⁻¹, the highest content of total nitrogen was 0.45 g kg⁻¹, the highest content of available phosphorus was 1.4 mg kg⁻¹, and the highest content of available potassium was 381 mg kg⁻¹. According to the national unified classification table of soil nutrient content, the pH values of three soil samples in Bainijing Town of Dingbian County are alkaline, the organic matter content is deficient, and the available phosphorus and total nitrogen content are extremely deficient.

1. Introduction  
At present, the rapid economic development leads to the reduction of cultivated land and the decline of cultivated land quality [1-2]. As an important means, land consolidation plays an important role in improving the quantity and quality of cultivated land [3-4]. Taking Bainijing Town, Dingbian County, Yulin City as an example, this paper aims to explore the impact of land consolidation on the improvement of soil fertility by studying the physical and chemical properties and nutrient characteristics of soil in the study area after land consolidation, and to provide reference and help for the implementation of similar projects in the follow-up.

2. Materials and methods

2.1. Natural conditions in the study area  
Bainijing Town is located in the northern part of Dingbian County, the northern boundary of Inner Mongolia Autonomous Region, the Loess Plateau and Inner Mongolia Ordos desert steppe transition zone. The geographic coordinates are 107°52′11″E, 37°43′29″N. It is a semi-arid continental monsoon climate, with a cold and dry winter, a warm and dry summer, and low annual precipitation. The annual average temperature is about 8°C, and the annual precipitation is about 400 mm. The soil type in the study area is mainly brown soil and sandy loam soil, with good aeration and waterholding capacity. The soil pH is about 7.5, and the total nitrogen content is about 0.8 g kg⁻¹. The available phosphorus and potassium content are moderate, and the organic matter content is moderate.

2.2. Sampling and analytical methods  
The soil samples were collected from three locations in Bainijing Town, Dingbian County, Shaanxi Province, and the soil samples were air-dried, sieved through a 2 mm sieve, and stored for further analysis. The soil pH was measured using a pH meter, the total amount of water soluble salts was measured by the potassium chloride method, the soil conductivity was measured by the soil conductivity meter, the soil organic matter content was measured by the potassium dichromate colorimetric method, the total nitrogen content was measured by the Kjeldahl method, the available phosphorus content was measured by the molybdenum antimony colorimetric method, and the available potassium content was measured by the flame photometry method. The soil nutrient content was analyzed according to the national unified classification table.
climate, characterized by intense summer and winter, dry climate, long winter, short summer, large
temperature difference, annual average temperature of 7.9 ℃, annual average sunshine of 2743.3 hours,
annual average rainfall of 316.9 mm, annual average frost-free period of about 141 days. There
are 30 administrative villages in the town. The main industry is agriculture, which is an important food
and animal husbandry production base in Dingbian County.

2.2. Sample collection method
According to the soil type and the distribution of crop varieties, according to the high, medium and
low fertility of the soil, 10 ha of soil was sampled as a mixed sample. At least three mixed
agrochemical soil samples were collected from the main farming soil species in each demonstration
village. Sampling points are distributed in serrated or serpentine patterns. The sampling routes and
schemes should be determined as evenly and randomly as possible. According to the thickness of
tillage layer, the sampling depth is 0-30 cm [5]. Soil samples were collected by multi-point mixed soil
sampling method, each mixed soil sample consisted of 30 samples. The distribution range of sample
points is not less than 3 mu. The depth and weight of soil taken at each point should be uniform, and
the proportion of upper and lower soil samples should be the same. The sampler should be vertical to
the ground and buried to a specified depth. Sample handling, storage and other processes do not
contact metal appliances and rubber products, in order to prevent pollution. Each mixed sample
usually takes about 2 kg. If too many samples are collected, the surplus soil can be discarded by
"quartering method". Sample number and file record, sampling record, soil sample number, sampling
location, longitude and latitude, soil name, sampling depth and sampling date were compiled [6-7].

2.3. Sample testing items and methods
Detection items: pH, conductivity, texture, available phosphorus, available potassium, organic matter,
total nitrogen, total water-soluble salt.

The instruments used for detection are: acidity meter (PHS-3C), conductivity meter (DDS-307A),
laser particle size analyzer (Mastersizer 3000), digital display electric sand bath (DK-3A), digital
bottle-mouth titrator (4760161), flame photometer (FP650), ultraviolet-visible spectrophotometer
(Lambda 650S), digital display constant temperature oil bath (XMTD-701), semi-automatic Kjeldahl
nitrogen analyzer (UDK129), and so on. Digital constant temperature water bath pot (HH) [8].

Detection methods: "Determination of pH in NY/T1377-2007 Soil"; "HJ802-2016 Soil Conductivity Measurement Electrode Method"; "GB/T 19077.1-2008 Particle Size Analysis Laser Diffraction Method"; "NY/T1121.7-2014 Soil Detection Part 7: Determination of Soil Available Phosphorus"; "NY/T889-2004 Soil Available Potassium and Slow Available Potassium Content Determination"; "NY/T1121.6-2006 Soil Detection Part 6: Determination of Soil Organic Matter"; "NY/T53-1987 Soil Total Nitrogen Determination Method (Semi-micro Kelvin Method); "Soil Detection NY/T1121.16-2006 Part 16: Determination of Total Soil Water Soluble Salts".

2.4. Data processing method
Microsoft Excel 2010 software was used for data collation and statistical analysis.

3. Result and analysis
3.1. Physicochemical characteristics of soil
From table 1, it can be seen that the pH value of soil samples is D001=D002>D003, and the soil in the
study area is alkaline; the total content of water-soluble salts in soil samples is D002>D003>D001,
which shows that the soil in the study area belongs to middle saline soil; the soil samples are silty soil,
D002 and D003 are silty loam; the organic matter content of soil samples is D002>D003>D001; and
the total content of soil samples is D002>D003>D001. Nitrogen content was D002 > D001 > D003;
available phosphorus content in soil samples was D002 > D003 > D001; available potassium content
in soil samples was D001 > D003 > D002.
3.2. Analysis of soil physicochemical properties and nutrient characteristics
From the experimental results in Table 1, it can be seen that the soil sample of D001 has a higher pH value. The soil in this area is alkaline soil. The content of organic matter, total nitrogen and available phosphorus is lower, the content of available potassium is higher, the physical and chemical properties of the soil as a whole are worse, and the improvement of soil quality is worse. Except for the low content of available potassium, other physical and chemical indicators and nutrient content of D002 at sampling point were on the upper middle level. The physicochemical properties and nutrient content of D003 samples were at medium level.

4. Conclusion
Soil samples were identified according to "Soil Salinization Classification Index in China", and the soil samples belonged to non-salinization. According to the National Classification Table of Soil Nutrient Content, the pH values of three soil samples in the land consolidation project of Bainijing Town in Dingbian County are alkaline, organic matter content is deficient, available phosphorus and total nitrogen content are extremely deficient; the soil texture of D001 sampling point is silty soil, while that of D002 and D003 sampling point is silty soil; the available potassium content of D001 sampling point is very rich. The contents of D002 and D003 were moderate and abundant.

References
[1] HUANG Xiaoyang, JIN Xiaobin, GUO Beibei, et al. (2014) Land Consolidation Regionalization of the Loess Platform [J]. Resources Science, 36(3): 438-445.
[2] Zhang Youshi, Guo Shaoli, Du Guoyuan, et al. (1986) Comprehensive surveys and research on land consolidation in Loess Plateau [J]. Resources Science, (3): 41-47.
[3] Li Yushan. (1999) Fundamental experiences for harness and development in the Loess Plateau of China [J]. Journal of soil erosion and soil and water conservation, 5(2): 51-57.
[4] Fu Bojie. (1989)The measures of rational land use in the Loess Plateau of Northern Shaanxi Province [J]. Journal of Soil & Water Conservation, 3(3): 33-39.
[5] ZHANG Zhong-qiu, HU Bao-qing, WEI Jin-hong. (2015) On the Con-notation and Development Direction of Comprehensive Land Man-agement Based on Ecological Civilization: A Case Study of Guangxi [J]. Journal of Qinzhou University, 30(8): 53-58.
[6] WANG Jing, SHAO Xiao-mei. (2008) Methodologies of Intensive Land Use Research: Is-sues and Trend [J]. Progress in Geography, 27(3): 68-74.
[7] Su Zhongren, Wang Jing. (1992) Water conservation benefits analysis of eight key national rehabilitation areas [J]. Soil and Water Conservation in China, (3): 1-4.
[8] Wang Ailing, Zhao Gengxing, Wang Qingfang, et al. (2011) Effects of and consolidation on soil physical and chemical characteristics of hilly region [J]. Transactions of the Chinese Society of Agricultural Engineering (Transactions of the CSAE), 27(9): 311-315.
[9] Liu Y, Guo Y, Li Y, et al. (2015) GIS-based effect assessment of soil erosion before and after gully land consolidation: A case study of Wangjiagou project region, Loess Plateau [J]. Chinese Geographical Science, 25(2): 137－146.
[10] Su Shaoqing, Lin Bishan, Zeng Xiaoduo. (2006) Ecological and environmental protection problems in land consolidation and the countermeasures [J]. Ecology and Environment, 15(4): 881-884.

[11] Luo Ming, Zhang Huiyuan. (2002) Land consolidation and its ecological and environmental impacts [J]. Resources Science, 24(2): 60-63.