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Study on the Application of Soil Quality Monitoring Technology in New Cultivated Land

Lei Shi[1,2,3,4]

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

[2]Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an 710075, China

[3]Key Laboratory of Degraded and Unused Land Consolidation Engineering, the Ministry of natural resources, Xi'an 710075, China

[4]Shaanxi Provincial Land Consolidation Engineering Technology Research Center, Xi'an 710075, China

Abstract

The integration and evaluation of new cultivated land quality monitoring system is an urgent need for the construction of national cultivated land quality survey and monitoring system. Through years of research, the index system and theoretical system for rapid monitoring of soil quality of newly added cultivated land are put forward innovatively, and a set of integrated technology and engineering mode for rapid monitoring of soil quality of newly added cultivated land is formed based on the fusion of multiple information. The theory of rapid monitoring of soil quality of new cultivated land was put forward, and the evaluation index system of soil quality of newly added cultivated land was constructed, which promoted the development of digital agriculture and precision agriculture, and provided demonstration support for rapid monitoring of regional cultivated land quality. The new system integrates the rapid monitoring technology of soil quality of newly increased cultivated land, which provides a new method for obtaining the monitoring data of soil quality and ecological environment of new cultivated land. The quality standard of new cultivated land in land consolidation project was established, and a set of integrated technology and engineering mode for rapid monitoring of new cultivated land quality was constructed, which realized the rapid evaluation and identification of the quality of new cultivated land, and provided technical support for soil quality evaluation of new cultivated land.

Keywords

New cultivated land; soil quality; real time monitoring.

1. Introduction

Cultivated land is the material basis for human survival and development. It is also the guarantee of sufficient quantity and quality of cultivated land. It is not only the need of economic development and social progress, but also an important guarantee of social stability and national food security [1]. The integration and evaluation of the new cultivated land quality monitoring system is an urgent need for the construction of the national cultivated land quality survey and monitoring system. Although the current cultivated land management has legal basis and guarantee, it is difficult to implement unified and efficient monitoring, management and evaluation on the newly added cultivated land resources due to the relatively single monitoring means of the current cultivated land quantity Lack of basic information [2]. The index system and theoretical system of rapid monitoring of soil quality of newly increased cultivated land is put forward, which promotes the development of digital agriculture and precision agriculture, and provides demonstration support for rapid monitoring of regional cultivated land quality [3].

In view of the time-consuming and laborious problem of traditional manual sampling, especially the demand of rapid, real-time and accurate detection of soil quality acceptance evaluation index of newly added cultivated land after land consolidation, a rapid monitoring method and mode of newly added cultivated land soil quality based on intelligent online monitoring, mobile laboratory field detection and remote sensing monitoring was proposed. Based on the principles of dominance, spatial variability and relative stability, the indicators that have important impact on the quality and productivity of cultivated land and can be monitored directly or indirectly through the model are screened out by combining with the monitoring technology of existing indicators or driving factors, and the monitoring index system of newly added cultivated land quality including soil physical index, nutrient index and so on is proposed and established The corresponding fast monitoring methods for various indexes are put forward [3].

2. Comparison of Research at Home and Abroad

Compared with similar technologies at home and abroad, a more comprehensive soil quality evaluation index system is constructed, and different monitoring technologies are integrated. The monitoring indicators can be obtained quickly and accurately, and the real-time evaluation of cultivated land soil quality has the advantages of timeliness and comprehensiveness [4].

Based on the ground multi-sensor characteristics of wireless network, a unified, real-time and efficient data transmission integration technology is established to improve the accuracy and timeliness of monitoring data acquisition. The mobile detection vehicle was developed to monitor the newly added cultivated land geographic indicators in real time, which connected the bridge between cultivated land and detection platform. Through the remote sensing image real-time monitoring of land productivity, vegetation coverage and land use type changes, the ecological benefits of new cultivated land were reasonably evaluated. A soil quality evaluation index system covering physics, nutrients and ecology was constructed, which contained more comprehensive information of cultivated land quality. At the same time, the index evaluation system was established, which solved the lag of cultivated land quality evaluation, and carried out real-time evaluation of soil quality [5].

3. Composition of Monitoring System

Through various ground sensors, manual observation data input, mobile monitoring equipment and other established monitoring data files, integrated intelligent on-line monitoring technology, in the information acquisition equipment, the instrument connection mode with workstation interface was used for dynamic real-time monitoring of soil. The on-site detection technology solves the real-time problems of fast detection of experimental samples and analysis of experimental data in land consolidation projects, and meets the dual use functions of flow detection and field test [6].

According to the change of the connotation of cultivated land quality under the new situation and the urgent need of large-scale, rapid, real-time and accurate monitoring of cultivated land quality, based on the rapid monitoring and evaluation of cultivated land quality informatization, combined with spatial remote sensing information technology, the rapid soil quality monitoring based on intelligent online monitoring technology, mobile laboratory field detection technology, remote sensing monitoring technology and other multiple information fusion was developed The integrated measurement technology has established the evaluation standards for soil quality of newly increased cultivated land in different types of areas, formed a set of integrated

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technology and evaluation system for rapid monitoring of soil quality of newly added cultivated land, improved the level of agricultural precision operation and informatization, played an important role in evaluating the productivity potential of farmland and protecting the ecological environment of agricultural field, and promoted the integrated development of land engineering technology and information technology, To realize the leap from traditional land consolidation to modern land consolidation, and provide theoretical and technical support for the prediction, decision-making and evaluation of major land and space renovation projects [7].

The essence of cultivated land quality is the comprehensive reflection of cultivated land productivity and cultivated land ecological quality factors. The key of cultivated land quality monitoring is to quickly and accurately obtain the information of indicators and monitor their changes. On the basis of fully analyzing the influencing factors of cultivated land quality, combined with the monitoring technology of existing indicators or driving factors, and based on the principles of dominance, spatial variability and relative stability, the indicators that can be monitored directly or indirectly through the model were proposed and established, including three major aspects of soil physical indicators, nutrient indicators and ecological indicators In addition, the corresponding rapid monitoring methods for various indicators are proposed [8].

In simultaneous interpreting different types of land remediation, we have developed different sensor construction schemes and fixed sensor configuration standards. At the same time, according to the topography characteristics of different regions, on-line monitoring sensors are expanded on the basis of standard configuration, and multi-sensor acquisition layer is used to meet the requirements of land consolidation quality and ecological monitoring.

According to the different data types and transmission modes of sensors, the key technologies and research contents of on-line can be divided into three modes: instrument connection with workstation software, instrument connection without workstation but serial output, and text data connection. The research of ground multi-sensor monitoring technology based on wireless network, that is, accurate acquisition of sensor data, research on wireless network connection and transmission, reduces the workload and error rate of artificial data processing, improves the accuracy and effectiveness of land remediation quality and ecological monitoring acquisition, and provides technical support for continuous positioning monitoring of soil quality of new cultivated land [9].

In the land consolidation project, it is necessary to monitor the physical and chemical properties of the newly increased cultivated land in real time, so as to guide the implementation of the project and the later land use. In view of the low efficiency, poor timeliness and in-situ detection indicators of traditional sampling and testing, we independently developed a mobile experimental vehicle suitable for land remediation projects, which can establish pH meter and soil nutrient meter to realize accurate and rapid monitoring of soil physical and nutrient indicators.

4. Application Benefit

Through the new rapid monitoring technology of cultivated land soil quality, the monitoring of 20 000 mu (1333.3 HA) of saline alkali land has reached the acceptance conditions. The rapid monitoring technology plays a decisive role in the control of saline alkali land and plays an important role in restraining the salt reversal of saline alkali land. Yulin Municipal Bureau of natural resources has carried out demonstration application in Yulin land development projects through the rapid monitoring technology of newly added cultivated land soil quality, and a total of more than 6000 hectares of newly increased cultivated land has been detected. The rapid monitoring technology has improved the acceptance rate.

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Weinan Natural Resources Bureau has carried out demonstration and application of new cultivated land soil quality rapid monitoring technology in Chengcheng County, Dali County and other county and district land development projects. A total of 10000 hectares of newly increased cultivated land has been detected. The acceptance rate has been improved through the rapid monitoring technology, and the comprehensive objectives of ecological governance, increase of cultivated land, increase of farmers' income, agricultural efficiency and rural development in the project area are ensured The benefits were significant.

Baoji Municipal Bureau of natural resources has carried out demonstration and application of new cultivated land soil quality rapid monitoring technology in Qianyang County, Longxian county and other counties and districts land development projects. A total of 666.7 hectares of newly increased cultivated land has been detected. Through the rapid monitoring technology, the acceptance rate has been improved, and the goals of ecological management, farmland increase and farmers' income increase in the project area have been ensured, and the acceptance of the project has been completed on schedule. Through the implementation of rapid monitoring technology of soil quality of new cultivated land, the completion unit can complete the project acceptance in advance, which is conducive to the early development of farming work, and is of great significance to ensure the national grain yield and farmers' agricultural income.

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