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Quantitative Remote Sensing and Intellectual Assessment of Cloud Platform for Salinity Content

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Introduction

Accurate agricultural production and increased crop yield require quick access to accurate soil quality information. With the advancement of the digital information industry, smart agriculture has emerged as a new trend in agricultural development, with an increasing demand for efficient and intelligent acquisition of good soil quality information. Many remote sensing quantitative inversion models have been developed by scientists around the world, but they must be systematised and intelligent in order for agricultural personnel to reap the benefits of information technology such as 3S (remote sensing, geographic information system, and global navigation satellite system) techniques.

As a result, in this paper, we designed a cloud platform for inversion analysis of moisture, nutrient, salinity, and other important soil quality indicators to meet the need of farmers, agricultural managers, and agricultural researchers for timely information on regional soil quality. The platform was built with ArcGIS (produced by the Environmental Systems Research Institute, Inc. of America in Redlands, CA, USA) and GeoScene (produced by GeoScene Information Technology Co.,Ltd., Beijing, China) software, with Java and JavaScript as programming languages and SQL Server as the database management system, with a PC client, a web client, and a mobile app. This platform has been used to analyse soil indicators in several areas, yielding good operational results and benefits. This research will enable rapid data analysis and technical assistance for regional agriculture production, thereby contributing to the advancement of smart agriculture.

Description

Precision agriculture is the application of information technology to better manage agricultural production and the modern agriculture development direction. Accurate agricultural condition information obtained quickly is the foundation for accurate agricultural production and increased crop yield. In the context of current global climate change, obtaining the regional soil quality status quickly and accurately is becoming increasingly important. The moisture-nutrient-salinity (SMNS) content of the soil is an important component of soil quality information that is also closely related to crop growth [1-3]. Obtaining SMNS content intelligently and in a timely manner is a pressing and realistic need of agricultural production, as well as a prerequisite for the development of smart agriculture. The traditional method of transporting a soil sample to a laboratory for testing, on the other hand, is time consuming and labour intensive, and regional analysis is difficult. Remote sensing is currently the primary tool for quantitative regional soil analysis, and many quantitative soil remote sensing inversion models have been developed by scientists worldwide.

These models can only obtain soil quality indexes quickly and intelligently through systematisation and intelligence. As a result, the design and development of information systems based on quantitative remote sensing for intelligent analysis of SMNS has become an urgent need. Choosing data sources for SMNS.There are typically two approaches. The more common method is to collect data from fixed or mobile monitoring stations and then use the spatial interpolation method to monitor regional soil quality. Wu et al., for example, designed and developed an online evaluation system to remediate heavy metal pollution in soil by collecting heavy metal index information in soil samples and employing the kriging spatial interpolation analysis method. However, this method is expensive because fixed stations are easily damaged and require complex maintenance, and mobile monitoring stations necessitate a large number of human and material resources [4,5].

Conclusion

As a result, completing the analysis of regional soil quality information is difficult. Another approach is to obtain soil quality data through quantitative remote sensing inversion, which entails establishing a quantitative relationship and model between spectral reflectance and soil quality data. The platform also allows for model modification, has extensive data analysis and mining capabilities, is lightweight, and has broad applicability. It can be widely used in different regions for the inversion and analysis of SMNS based on quantitative remote sensing, and it provides data and decision support for regional precision fertilisation and intelligent agriculture development. The platform can perform fast, non-destructive, and intelligent inversion of regional soil quality information and analyse the spatial-temporal distribution characteristics of soil quality, providing decision-making recommendations for precision agriculture development.

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Conflict of Interest

Authors declare no conflict of interest.

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