JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

IOT & BLOCKCHAIN BASED SOIL AUTHENTICITY SYSTEM

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ABSTRACT: - *Soil authenticity refers to the process of verifying the quality and origin of soil samples. This is essential in various industries such as agriculture, food production, and environmental monitoring, where the quality of the soil can have a significant impact on the final product or outcome. Authenticity testing typically involves analyzing the physical and chemical properties of soil samples to determine their composition, structure, and potential contaminants. This can be done through various laboratory tests, such as soil texture analysis, pH measurement, and nutrient analysis. However, traditional authenticity testing methods can be time-consuming, costly, and may not provide a complete picture of the soil's history and quality. This is where new technologies such as IoT and blockchain can play a significant role. By using IoT devices to collect data on various soil parameters in real-time, and storing this data on a tamper-proof and transparent blockchain platform, it becomes possible to verify the authenticity of soil samples more efficiently and accurately. The IoT devices will be responsible for collecting data such as soil moisture, temperature, pH levels, and other relevant parameters. This data will be securely transmitted to the blockchain platform, which will store it in a tamper-proof and immutable manner. To verify the authenticity of the soil, the system will use machine learning algorithms to*

analyze the collected data and compare it with the expected values for a particular type of soil. If there is any deviation from the expected values, the system will flag the sample as potentially inauthentic. Machine learning algorithms can also be used to analyze this data and flag any deviations from expected values, making it easier to identify potentially inauthentic soil samples.

1. INTRODUCTION:

The soil is a fundamental resource that sustains life on Earth, providing the essential nutrients needed for plant growth and food production. However, the quality of the soil can vary significantly depending on factors such as location, weather, and human activities such as farming and mining. The authenticity of soil samples is critical in various industries, such as agriculture and food production, where the quality of the soil can have a significant impact on the final product or outcome. Traditional authenticity testing methods can be time-consuming, costly, and may not provide a complete picture of the soil's history and

quality. This is where new technologies such as IoT and blockchain can play a significant role. By using IoT devices to collect real-time data on various soil parameters and storing this data on a tamper-proof and transparent blockchain platform, it becomes possible to verify the authenticity of soil samples more efficiently and accurately. Machine learning algorithms can also be used to analyze this data and flag any deviations from expected values, making it easier to identify potentially inauthentic soil samples. The proposed system aims to create an IoT and blockchain-based solution for soil authenticity verification. This system will consist of IoT devices installed in the soil and a blockchain-based platform that stores data related to soil samples. The IoT devices will collect data such as soil moisture, temperature, pH levels, and other relevant parameters, which will be securely transmitted to the blockchain platform. The blockchain platform will provide a transparent and traceable record of the soil sample's journey from the farm to the end consumer. This will help to ensure that the soil has not been tampered with or contaminated at any point during its production and distribution process. Overall, the proposed IoT and blockchain-based soil authenticity system will provide a reliable and efficient way to verify the quality and origin of soil samples, leading to better outcomes for producers, consumers, and the environment.

2. EXISTING TECHNIQUE:

There are various existing methods and technologies used for soil authenticity testing. These include traditional laboratory tests, such as soil texture analysis, pH measurement, and nutrient analysis, as well as more advanced techniques such as DNA sequencing and isotopic analysis. However, these traditional methods can be time-consuming, costly, and may not provide a complete picture of the soil's history and quality. There is also a risk of human error, as the interpretation of the test results can vary between analysts.

3. SYSTEM HARDWARE:

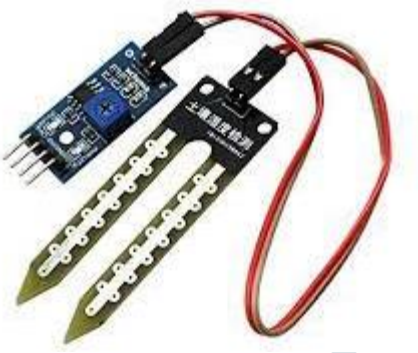
3.1 NODE MCU:

The NodeMCU boards can then transmit this data to a blockchain platform, which can be hosted on a cloud-based server. The blockchain platform can use a public blockchain such as Ethereum or a private blockchain such as Hyperledger Fabric, depending on the specific requirements of the system. Each NodeMCU board can be assigned a unique identifier, which can be used to track the data transmitted by that board on the blockchain platform. The data can be stored as transactions on the blockchain, which are time-stamped and cryptographically secured to prevent tampering. To ensure the authenticity of the soil samples, the blockchain platform can also be used to store data related to the production and distribution process. This can include information such as the location of the farm, the use of fertilizers and pesticides, and the transportation routes taken.

3.2 SOIL MOISTURE SENSOR:

The soil moisture sensor measures the amount of water present in the soil and transmits the data to the NodeMCU board. The NodeMCU board then sends the data to the blockchain platform for storage and analysis. The soil moisture sensor can be connected to

the NodeMCU board using analog or digital input pins. The analog input pins can be used to measure the voltage output of the sensor, which is proportional to the soil moisture level. The digital input pins can be used to read the digital output of the sensor, which indicates whether the soil moisture level is above or below a certain threshold.



3.3 TEMPERATURE SENSOR:

The temperature sensor can measure the temperature of the soil and transmit the data to the NodeMCU board. The NodeMCU board can then send the data to the blockchain platform for storage and analysis. The data collected from the temperature sensor can be used to optimize the growth of crops. Different crops have different temperature requirements for optimal growth. By monitoring the temperature of the soil in real-time, it becomes possible to ensure that the temperature is within the optimal range for the crop being grown. This can lead to higher crop yields and better-quality produce.

3.4 pH SENSOR:

The pH sensor can measure the acidity or alkalinity of the soil and transmit the data to the NodeMCU board. The NodeMCU board can then send the data to the blockchain platform for storage and analysis. the data from the pH sensor can be used to identify potential issues with soil quality. For example, if the pH level is consistently too low or too high, it may indicate that the soil is too acidic or alkaline and lacks sufficient nutrients to support optimal plant growth. By analyzing this data in combination with other sensor data such as nutrient levels and soil moisture, it becomes possible to identify and address issues with soil quality more efficiently.

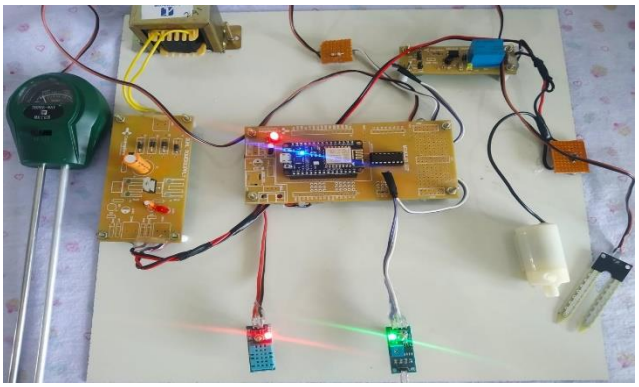
3.5 AIR HUMIDITY SENSOR:

The air humidity sensor can measure the moisture content in the air surrounding the soil and transmit the data to the NodeMCU board. The NodeMCU board can then send the data to the blockchain platform for storage and analysis. The data collected from the air humidity sensor can be used to optimize the growth of crops. Different crops have different humidity requirements for optimal growth. By monitoring the humidity level of the air surrounding the soil in real-time, it becomes possible to ensure that the humidity level is within the optimal range for the crop being grown.

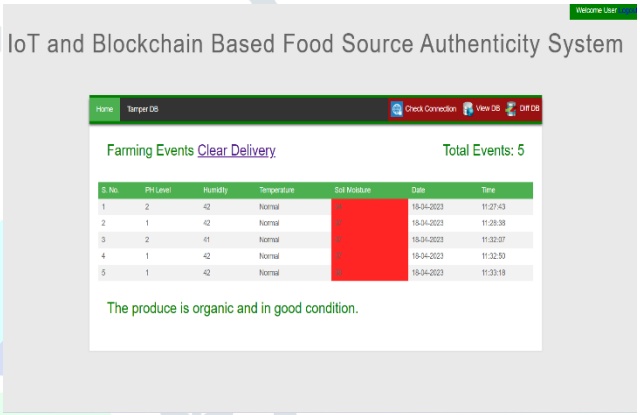
4.WORKING OF PROPOSED METHOD:

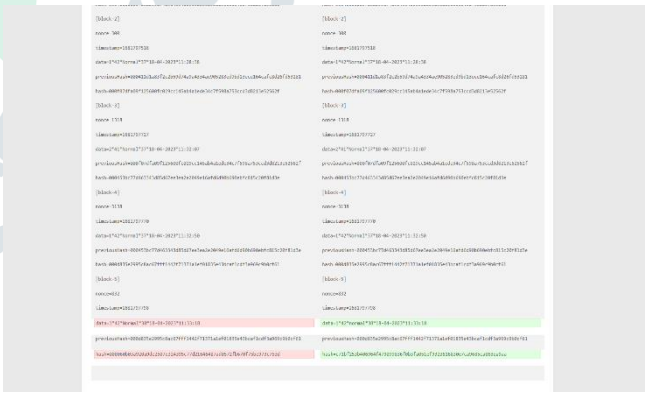
The system consists of a NodeMCU board, which is connected to sensors such as soil moisture, temperature, pH, and air humidity sensors. The sensors are used to collect data on the respective parameters of the soil and environment. The data collected by the sensors is transmitted to the NodeMCU board, which is connected to the internet via WiFi. The NodeMCU board sends the collected data to a blockchain platform for storage and analysis. The blockchain platform ensures that the data is secure, immutable, and tamper-proof. It also allows for transparency and accountability by providing a transparent record of all the transactions that take place on the platform. The collected data can be used to monitor the health of the soil, optimize crop growth, and identify any issues with soil quality. For example, if the soil moisture level is consistently low, it may indicate that the soil lacks sufficient water for optimal plant growth. By analyzing this data in combination with other sensor data, it becomes possible to identify and address issues with soil quality more efficiently. The use of blockchain technology ensures that the data collected from the sensors is authentic and tamper-proof. This is important in cases where the soil authenticity needs to be verified, such as in the case of organic farming or the certification of agricultural products. The blockchain platform provides a transparent record of all the transactions that take place on the platform, ensuring that the data is verifiable and trustworthy. The system has the potential to revolutionize the agricultural industry by providing farmers with real-time data on soil health and enabling them to make data-driven decisions that can lead to higher crop yields and better-quality produce.

5. RESULT:



OUTPUT:





The system can be used in various applications such as monitoring soil quality for agricultural purposes, verifying the authenticity of soil samples, and ensuring compliance with organic farming or agricultural product certification standards.

6. CONCLUSION:

In conclusion, the IoT and blockchain-based soil authenticity system is a powerful tool for monitoring soil health, optimizing crop growth, and ensuring the authenticity of soil samples. The system uses sensors to collect data on various parameters of the soil and environment, which is transmitted to a blockchain platform for storage and analysis. The use of blockchain technology ensures the authenticity and security of the collected data, making it useful for verifying the authenticity of soil samples and ensuring compliance with organic farming or agricultural product certification standards. The system can also help identify potential issues with soil quality and optimize crop yields by providing real-time data on soil moisture, temperature, pH, and air humidity levels. Overall, the IoT and blockchain-based soil authenticity system has the potential to revolutionize the agricultural industry by providing farmers with real-time data on soil health and enabling them to make data-driven decisions that can lead to higher crop yields and better-quality produce.

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