Secure B-IoT Based Smart Agriculture– A Brief Review

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Abstract. The future world is moving towards creating innovative technology where intelligent
Smart lifestyles are created in homes, smart farming in the agriculture sector, and smart cities. The
IoT is one of the world's most famous inventions in the decade. Life is made comfortable by IoT by
connecting devices and generating more than billions of data. However, a major concern in IoT is
data security as it handles a large number of complex data. A security issue in IoT devices is a
major concern. Blockchain IoT is a possible protection option. Blockchain IoT technology is used
for enhancing protection in agriculture. The key focus is to resolve various phases of the farm
supply chain by developing procedures. This paper discusses the security issues in IoT and how it
overcomes by integrating IoT with Blockchain. Further, the discussion involves the application of
IoT blockchain security in Precision farming.

Keywords: Internet of Things (IoT), Blockchain, Security, Agriculture, Distributed Ledger

1. Introduction
The Internet of Things (IoT) is expected to permit communication between a large number of smart
devices with less human intervention by using sensors and actuators. More than a million smart devices
are connected to the IoT environment, which will interact with each other, leading to complicated security
provisioning for efficient global IoT communication [1]. The Internet of Things development also
increases the risk of data security and privacy issues, a growing problem in IoT, and a buzzing topic to be
resolved. The researchers are exploring the areas to improve the security issues in IoT. Here comes the
blooming solution, "Blockchain." Blockchain is a technique that uses cryptocurrencies, distributed ledgers
for improving data transparency and data security. Blockchain is a decentralized database despite a
centralized database as in IoT security platform [2]. Thus, Blockchain enables its users to secure
transactions as it runs on consensus algorithms and smart contracts. Combining IoT with Blockchain
would boost device efficiency in real-time applications [3].
Blockchain's three key features are database, agreement, and intelligent contracts. Each transaction is
stored in the distributed directory, and the transactions cannot be edited, which provides a job proof
(PoW) inside the method. All the transactions are encrypted, and only the authorized users can view the
transactions, which helps avoid data tampering in the system [4].In Figure 1, the use cases of Blockchain
in agriculture are mentioned. The Blockchain helps the consumers trace the food products' journey, which
reduces wastage of food and keeps food fresh. It also helps keep the insurance document and other data
confidential using Blockchain and optimizing its production price. Transactions are more transparent, and
fraud can be eliminated.
2. Architecture Framework For IoT And Blockchain

Blockchain requires hash functions, which require a high amount of computations, time, resources, and energy [5]. The nodes are positioned in an upper layer that performs high energy-consuming tasks, ensuring the system's high efficiency and security. Some of the widely used hash functions are SHA-256 by swift coin, Peercoin, Gridcoin, SHA-256d by Bitcoin, etc. In Figure 2, Blockchain IoT architecture has been developed for a health monitoring system that gives a flow of data from IoT and Blockchain network [6]. The IoT architecture's application layer comprises the blockchain[7] service integrated with a Javascript Web3.js, a collection of Libraries that can interact with the Ethereum Blockchain [8].

3. Security Concern In Smart Agriculture

The domestication of wireless sensors and cloud-involved applications in the farming sector has increased day by day[9] without knowing and clear idea about the cyber attacks. The major issue in using such smart technologies increases the privacy and security issues in the agriculture domain [10]. Figure 3 shows some of the major security issues in IoT. The main problem in using Internet of Things devices is the confidentiality of data, communication network security which should be eradicated in smart technologies.
There is a potential threat of data-stealing in the agriculture domain, which incurs a great economic loss. In smart agriculture, lots and lots of sensors are fabricated to monitor crop health and environmental factors. Several heterogeneous uses of drones with agriculture, sensors, devices, and equipment produce enormous quantities of dynamic and complex data [11]. Potential risks may be triggered by leaking such information either by unauthorized access or through the worker involved in farming. Leakage of information from agricultural anti-jamming devices may help a hacker bypass security measures, resulting in huge economic loss for the farmers [12].

4. Integration of Blockchain And IoT In Smart Agriculture

Blockchain technique provides enhanced data traceability and immutability. Moreover, blockchain technology is better than existing relational databases. In Blockchain, the system will not suffer from single-point failure. In other words, if the participant node makes the incorrect change, then it will be corrected immediately by the remaining nodes. This feature intensifies the trust of information stored in the blockchain system [7]. By implementing the latest techniques like Blockchain and IoT in farming, every aspect of conventional farming schemes can be altered fundamentally. The seamless integration of IoT and wireless sensors in intelligent farming systems has recently raised farming to earlier levels considered unimaginable. Moreover, integrating Blockchain with IoT enhances the data value and security in the system. The data/information it handles is more valuable and reliable and cannot be eliminated or modified, accessed without storing operation in Blockchain; operations traceability can be performed [13].

Blockchain technology is a distributed ledger technology that creates a chain of blocks. The blocks are interconnected with each other through the reference, i.e., hash functions. The hatching feature of the previous block is sent to the next block. Therefore, it is impossible to manipulate the entire data, as manipulations are to occur in each block to modify and alter the data. [14]. The nature of the Blockchain gains its strength in security mechanisms in banking and other financial sectors. The three major parts of Blockchain security are public/private key, hash functions, and decentralization database [15].
Blockchain is most popular for Bitcoin and Ethereum, provides an interesting IoT encryption solution. The Blockchain contains solid data security, locking access to Things’ Internet and shutting down infected computers in an IoT network. [8] The Blockchain is a decentralized infrastructure that addresses scalability, trust, and secrecy issues in IoT. The Blockchain will allow trillions of devices to be monitored. Blockchain technology can help manage transactions and organize the system's resources. The transparent design of blockchain technology allows to share data and to avoid attacks at specific points. In Figure 4, the workflow of how the transaction is created and the flow of the blockchain network is represented diagrammatically.

![Figure 4: WorkFlow of Blockchain](image)

The major problem in developing e-agriculture or smart farming is the large number of complex data collected from the sensors, which involves existing centralized database servers such as environment monitoring system from the government meteorological database, which increases the chances of data loss and data distortion and ends up in a major effect in the crop health monitoring. This can be avoided by using blockchain technology with a decentralized database and has a less chance of data loss and distortion, as in existing methods. In Figure 5, a flow of data of the food supply chain with Blockchain, consensus methods, and platforms is given, which can be implemented for real-time applications in smart farming. The inputs give seeds, fertilizer, pesticides, electricity, irrigation, machinery, labor, and management. The major process observed and stored is pre-planting, Cultivation, Harvesting, storage, processing, marketing, and consumption. Outputs are products, Health, Nutrition, Water, Recreation services, etc. The blockchain types used are permission or permission less. Platforms are ethereum and hyper ledger. PoW/PoS/BFT is the consensus mechanism.
Smart agriculture with Blockchain raises the agriculture sector's standard. It involves many farmers participating eagerly in smart farming without any hesitation in security and privacy issues and decreasing the farmers' technological barrier. Most secured data can be collected for uploading to the Blockchain. This can increase crops' production, and transactions are made easy for the farmers and enhance the country's economy.

5. Related Works

The use of blockchain technology to solve different security concerns, specifically data accuracy, has opened up a facet for IoT to explore the possibility of using IoT blockchain. Blockchain is primitively a non-editable, decentralized, and cryptographically protected ledger tolerant. This nature of Blockchain makes it an attractive alternative for addressing security problems such as integrity of data, authentication of the entity, etc... It also needs a decentralized validation mechanism in an IoT setup where devices are spread across a large geographical region provided by a blockchain. In this paper, a survey of different studies related to Blockchain IoT security is being carried out to protect IoT networks. In Figure 6, various applications of Blockchain security which is ongoing in real-time were given. In a smart health monitoring system, the patient's records should be kept with most confidentiality, which can be achieved by Blockchain and eliminates the organization's risk and the individual. Similarly, in the banking sector, the banks' transactions, Customer details, and each transaction are maintained properly without the risk of data loss or hacking. In the Agriculture sector, from production to supply, every information can be stored in a decentralized manner, which helps increase the safety and security of the quality of food without compromise.
6. Conclusion

The development of smart applications like smart cities, smart agriculture, smart apps, Intelligent health care systems, etc., are built by the Internet of things (IoT) as a backbone for every innovation in our daily life. The smart devices domesticated with IoT technology in agriculture are mounted at any place such as soil, water, plants, leaves, etc. They are sometimes used in an unrefined way with or without observations. The unobserved devices may prone to severe risk of data leakage, and the system's security could be of great question. The traditional security system in IoT is encryption Device Identification, RFID, etc., helps to some extent but not to the system's complete security because of IoT's dynamic nature. Researchers are exploring Blockchain technology as it provides a solution for encryption paradigms because of a few characteristics, such as immutability, non-editability, decentralized database, and distributed environment. In the future, a novel architecture for IoT using blockchain technology in smart farming with different consensus algorithms can be proposed, which may help to improve the agriculture sector.
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