Title

How can blockchain ensure the safety of food products by tracing their origins and quality?

Summary

Food safety is important for the whole supply chain, from stakeholders and manufacturers to consumers. Ensuring the quality and integrity of food is of utmost importance. Bad-quality food can lead to many foodborne diseases.

Blockchain ensures the integrity of food by tracking its whole history from the source of origin of ingredients, production date, quality details and transportation details.

This report investigates the potential of blockchain in ensuring food safety by tracking origins and quality. It explores the advantages, challenges, and real-world applications of this technology.

Introduction

Traditional methods of food traceability give incorrect data, slow response time during recalls, supply chain fraud, and difficulty in tracing products throughout the food chain. Contaminated or substandard food products can lead to food poisoning, food wastage/spoilage and damage to the company reputation.

Blockchain enables securing the trust between consumers and supply chain stakeholders by including transparency in the system.

Findings

The Economist called Blockchain Technology "The Trust Machine" in 2015.

In the same year, China experienced a massive food safety issue, with government seizure of 100,000 tons of smuggled pork, beef, and chicken, some of which dated back to the 1970s.

17% of global food production gets wasted, according to the UN Environment Programme's (UNEP) Food Waste Index Report 2021.

All these led to the adoption of Blockchain for food fraud and traceability.

Body

A Blockchain is a ledger on which new transactions are recorded on blocks, and a cryptographic hash of data identifies each block. It is impossible to recreate the data from this hash. Even if a tiny detail of this transaction data is changed, it creates a different hash where each hash of the block included as a data point in the next block, making tampering extremely difficult.

Steps

1. Data Entry: Accurate and relevant information must be recorded on the product in the food chain at every step of the supply chain.

2. Immutability: Recorded data cannot be deleted or altered except by an authorized user, ensuring data integrity. It allows for tamper-free data.

3. Transparency: Consumers and stakeholders can access the blockchain to verify the authenticity and quality of the product. Blockchain and IOT can track the entire food chain supply within seconds.

4. Smart Contracts: Self-executing code can automate specific actions, when predefined conditions meet.

Benefits of using Blockchain

1. Enhanced Traceability and Transparency: Consumers can trace their food journey. This transparency builds trust and allows for rapid identification and preventing the spread of contaminated products and foodborne illnesses.

2. Improved Quality Control: Substandard products can tarnish the brand reputation. Therefore, data regarding quality can help producers identify and rectify quality issues more quickly. It helps in preventing food wastage and improving overall product quality.

3. Prevention of Fraud: Immutable records make it difficult for counterfeit products to enter the supply chain. Blockchain enables real-time verification of the product through RFID tags and QR codes to ensure its genuineness.

4. Streamlined Supply Chain: Blockchain can automate the supply chain processes by reducing administrative overhead, fraud, and human errors.

5. Regulatory compliance: Blockchain ensures that regulatory requirements meet as per market standards. It provides a tamper-free record of food safety compliance throughout the supply chain.

Challenges

1. Adoption and awareness: Blockchain technology needs widespread adoption by all food manufacturers, retailers, and everyone across the whole food supply chain. Organizations, especially the big ones, need to be aware of the tremendous potential of blockchain in ensuring food safety and authenticity. Using their example, the small ones will follow.

2. Interoperability: Ensuring compatibility and interoperability among blockchain systems and supply chains must be done.

3. Data accuracy: Record in the blockchain should be error-free. Before data entry, it should be for validated.

4. Privacy Concerns: Sensitive businesses hesitate to use blockchain since they fear the public blockchain will expose the data. Permissioned blockchains can address this issue.

Real-World Applications

1. Walmart

partnered with IBM to create a food traceability system based on the Hyperledger fabric. Walmart could trace mangoes stored in the US stores in 2.2 seconds.

Walmart, in collaboration with JD, IBM, and Tsinghua University built a Blockchain ledger to track the movement of pork for its Chinese supply chain in 2016.IBM helped with blockchain, while Tsinghua

University acted as the technical advisor for the technologies for the process.

In 2017, Walmart partnered with food supply chain industries such as Dole, Kroger, McCormick, Nestle, Tyson Foods and Unilever to adopt the Blockchain technology.

All suppliers of green leafy vegetables were required to capture the data using the IBM Food Trust network using GS1 standard communication protocols such as EPCIS. This method allowed Walmart to trace back their produce.

Walmart introduced blockchain technology back in 2019 to trace shrimp sourced in Andhra Pradesh, India and shipped to the USA.

Thus, Walmart emerged as a leader in adopting blockchain for its suppliers and retailers.

2. Nestle

Nestle utilized the IBM Food Trust Blockchain ledger to help users trace the origin of its products like Mousline puree and Zoegas coffee brand. Zoegas made from coffee beans from Brazil, Rwanda, and Columbia. Nestlé, with The Rainforest Alliance was able to track farmers and harvest information for cocoa beans in Zoegas coffee. Also, customers can view blockchain data that provides extensive information about the farmers, transactions for specific shipments, harvest time and roasting period.

3.BumbleBee Foods:

It uses blockchain to track tuna operations - from the moment the fish is caught. They check for food fraud, product tampering, or issues with food contamination that help with rapid product recalls.

Some countries use blockchain to combat illegal, unreported, and unregulated fishing by tracking the origin of seafood products.

Conclusion

Blockchain technology has the potential to revolutionize the food industry by ensuring the safety of food products through transparent and immutable traceability. By providing a secure and tamper-proof ledger, blockchain enhances trust, reduces fraud, and improves the overall quality of food products. It helps in building the brand reputation and trust with the consumer. While challenges exist, ongoing developments and real-world applications by multinational companies demonstrate viability and value of blockchain in ensuring food safety.

As the technology matures and gains broader adoption, we expect it to play an increasingly significant role in safeguarding the global food supply chain, protecting consumers, and supporting regulatory compliance. Blockchain enables faster and more cost-efficient delivery of products. Consequently, stakeholders across the food industry should integrate blockchain solutions into their operations to harness these benefits and enhance food safety.

References

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