International Journal of Food Science and Agriculture, 2023, 7(2), 290-293
https://www.hillpublisher.com/journals/jsfa/
ISSN Online: 2578-3475
ISSN Print: 2578-3467

Analysis of the Application of Blockchain in Ecological Food Safety Management

Chao Gong[1,*], Yichang Yuan[2]

[1]China Agricultural University, Beijing, China.
[2]ShanghaiTech University, Shanghai, China.

How to cite this paper: Chao Gong, Yichang Yuan. (2023) Analysis of the Application of Blockchain in Ecological Food Safety Management. *International Journal of Food Science and Agriculture*, 7(2), 290-293.
DOI: 10.26855/ijfsa.2023.06.019

Received: June 4, 2023
Accepted: June 30, 2023
Published: July 29, 2023

***Corresponding author:** Chao Gong, China Agricultural University, Beijing, China.

Abstract

For a long time, food safety has been widely concerned by all walks of life. The whole production and trading process of the food industry chain is transparent is the premise of ensuring food safety. The construction of ecological civilization and ecological economic development require modern agricultural production to become environment-friendly and green. However, due to the influence of traditional agricultural production mode, hormones such as hormones, fertilizers and pesticides exceed the standard, making green food no longer "green". With the development of IT technology in recent years, blockchain has been used in various fields, and has achieved remarkable results, especially in the ecological food safety management, and the application of blockchain plays a decisive role. This paper explores the application of blockchain in ecological food safety management, adopts case analysis, literature summary and other means, starts from the connotation of blockchain technology, points out the role of blockchain in ecological food safety management, and expounds the specific application measures and suggestions for reference.

Keywords

Blockchain, ecological food, safety management

Foreword

In an early study, Academician Zhong Nanshan proposed that the occurrence of ovarian cancer, bowel cancer and other diseases has a direct relationship with food residue ripening agents and growth agents. According to the World Health Organization survey, 600 million people worldwide suffer from foodborne diseases and cause more than 420,000 deaths every year. General Secretary Xi Jinping has also pointed out that in addition to ensuring that the people are full, we must also ensure that they can eat safely and safely. In this regard, this paper takes ecological economy as the core, and briefly discusses the role and application of blockchain in the field of ecological food safety management.

After more than 20 years of development, blockchain technology has gradually become a new technology widely used in various fields in China. This new technology has changed the world pattern dramatically. In recent years, with the continuous development of the currency, people's desire to explore block chain technology more and more intense, it is as in the Internet mobile network mode formed a new technology, is based on the paper credit, blood credit and precious metals credit under the development of a new milestone, in the block chain system, application layer, data layer, contract layer, consensus layer and incentive layer is an indispensable part. Blockchain technology has very obvious characteristics, its decentralized content is very clear, and at the same time, it can not be arbitrarily changed, open and other characteristics. Blockchain technology has a very powerful mechanical self-care function, and users can also reflect their anonymity in the process of using blockchain technology. Blockchain technology is extremely subversive. It is still in the initial stage during the government governance period. The principle of blockchain technology has been widely used in science and technology management, logistics and transportation and other aspects, but it has not been widely applied in the process of government governance.

1. Technical connotation of blockchain

In a narrow sense, blockchain usually refers to the data structure chain, which sorts and combines the data blocks according to the temporal order, and ensures that the relevant data is not tampered with or falsified with the help of encryption technology. Blockchain technology uses blockchain data to generate and store data, uses distributed node consensus algorithm to track the data, and uses password and other ways to ensure the security of data transmission and access, and uses a new distributed architecture and computing paradigm of data programming and operation with smart contracts. The distributed ledger generated by blockchain technology can ensure the validity of the transaction between both parties, and also permanently check the transaction [1].

2. The role of blockchain in ecological food safety management

2.1 Help to the digital construction of ecological food industry

Blockchain technology matches the dispersion and huge characteristics of the food industry chain. Through the data chain of the whole process of origin, processing, production and sales, all the information is linked in the database (distributed), and the granularity of the database construction can be fine from seeds, fertilizers to the table. Since the food industry chain involves everyone, the construction of the centralized data system of the whole industry chain not only requires a huge amount of capital, but also is difficult to achieve. Using block chain database architecture, food industry informatization construction does not need to rebuild, repeated investment, only need to upgrade on the existing achievements, chain, by the user subject construction, then by the upstream and downstream alliance chain, finally form a public chain, the block chain itself through the industry data, eliminate "information island", realize the whole industry chain interconnection, reduce transaction costs, improve the management efficiency.

2.2 Help to trace the source of the ecological food industry chain

Blockchain is a technical system that is jointly maintained by all parties, using cryptography to ensure the security of data transmission and access, and ensure the consistent storage of data, without being tampered with. Data is chain, using the chain of data inspection and storage, through the hash value inspection data is true, each block has a credible timestamp, thus form can trace the deposit information, ensure that the chain data is not tampered with by others, easy to effectively follow the food industry, help to clarify responsibility, control risk, the construction of food industry credit and trust mechanism, and realize the goal of food safety regulation [2].

2.3 It helps to reshape the ecological food industry trading system

Block chain technology is the core value of integrity, equality, the system of each node obligations, rights are equal, on the basis of using its tamper-proof build credit system, using point-to-point transmission mode for centralized trading, no intermediate link, high transparency, let food producers consumers have more control, in order to reverse the problem of inequality, reduce transaction costs, improve the transaction efficiency. The food industry is the basic guarantee for the survival of human beings. Using blockchain technology to innovate the existing food trading system and gradually build a reasonable and scientific food safety guarantee system will better benefit the people.

3. Application and suggestions of blockchain in ecological food safety management

3.1 The application of blockchain in ecological food safety management

3.1.1 Origin tracking

According to the survey, one in 10 people around the world have a foodborne illness every year because consumers cannot trace it back

The complex supply chain of food roots, from the food origin to the table, is out of reach for consumers. In recent years, this situation has changed with the advent and application of various emerging technologies. For example, Wal-Mart and IBM work together to help Walmart improve its supply chain tracking capabilities in the Chinese market. Taking Mango as an example, it takes days, sometimes even weeks, to complete a case of mangoes based on the supply chain tracking system. But if you use the "tracking-recording" module of blockchain technology, it only takes a few seconds to complete a whole box of mango records. These technologies will not only help every company in the food industry, but will actually benefit the food industry as a whole [3]. Whenever foodborne diseases occur, major supermarkets and restaurants will issue various announcements, the themes of which are to thoroughly investigate the disease. However, the blockchain "track-record" module can quickly find the source of the food, after which the merchants can remove the relevant food from the shelves, and even terminate the contract with the suppliers. For example, several consumers were admitted to food poisoning in a restaurant after which the incident was related to cucumber salad. The restaurant used the blockchain "track-record" module to find the serial number and manufacturer of this batch of cu-

cumbers. While stopping purchasing the producer of cucumbers, the product was marked on the blockchain, that is, the manufacturer's products are not qualified. In this case, the downstream purchaser of the supplier can also obtain the message and make timely adjustments.

It should be noted that there are two premises to realize the blockchain "tracking-recording" scheme. First, each product packaging in the supply chain, such as containers, crates, etc., is unique and identifiable. At this point, the Global Standards Organization proposed a unique code, GTINs, to solve the packaging problem of products. Second, everyone in the supply chain has to give up every step of the custody of the product, so that they can instantly trace the food source through the blockchain.

3.1.2 Test of the authenticity of product labels

At present, major businesses post "no additives, organic" and other labels on their products to attract consumers to consume and increase marketing costs. But many consumers don't know the authenticity of these labels? Does it really mean what he means? Such as some time ago, the well-known "Pu Gu Tang", was exposed to the problem of stolen picture publicity, how consumers trust product publicity is also a serious problem. At the present stage, there are indeed companies in the work of food label certification work, such as where the food from the company, the form of a third party to check whether the product meets the "organic" conditions, from the soil quality, planting environment and other aspects to check whether the product quality meets the "organic" standards [4]. The meat sold on the market, must have an inspection and quarantine seal to enter the market. Similarly, manufacturers can only be labeled organic if their products meet "organic" standards. However, the application of blockchain technology can improve the height of the credibility of product labels. The combination of the third party organization and the credit system of the blockchain technology manufacturers can ensure the authenticity of the product label. After the inspection, only the third party organization needs to upload the product credit report to the supply chain.

3.1.3 Market regulation

The application of blockchain technology in the field of ecological food safety management can significantly improve the efficiency of market supervision. Through regular sampling inspection of food to understand the food source and relevant data, regulators can not only reduce material and manpower input and reduce supervision costs; but also can quickly respond after safety incidents to achieve the ideal market supervision effect. For example, in the case of food removal recall, when the regulator finds the contamination of food raw materials, they can find out which contaminated raw materials were used according to the food flow data and which batches affected the food, so as to recall the shelves in a timely manner [5]. It can be seen that blockchain technology can help regulators to grasp the scope of food circulation, and timely formulate emergency measures for control, so as to avoid the widespread spread of problematic food. For another example, it is in the food freshness period. Although cold storage technology can prolong the storage period of food, it is difficult for manufacturers to grasp the quality of food in transportation and refrigeration, especially agricultural products whose storage period is short, it is difficult for manufacturers to control its quality, and cannot ensure the days on sale and the purchase time of consumers. The use of blockchain technology in it not only facilitates the manufacturer to grasp the refrigeration information at each point in time and strengthen the management of food sales; but also facilitates the market regulator to understand whether the food is sold during the preservation period, so as to eliminate food safety problems and realize efficient food operation.

3.2 Suggestions on using blockchain to promote the development of ecological food economy

Combined with work experience and relevant investigations, it is found that blockchain has huge application advantages in the field of ecological food safety management. However, there are still many difficulties to build a safety management system with "food source traceability and flow query". Relevant departments should formulate a series of measures based on the actual situation to give full play to the role of "blockchain + ecological food safety management" and improve the application effectiveness.

3.2.1 Reform of agricultural production facilities

In the production and circulation of ecological food, food from seeds, fields to table involves farmer production, enterprise processing and transportation. At the same time, the use of fertilizers and pesticides, transportation time and temperature control, etc. The collection and transmission of a large amount of information need to be supported by infrastructure and information system. Therefore, increasing the reform of agricultural production facilities is conducive to the application and promotion of blockchain in ecological food safety management, so as to promote the development of modern ecological agriculture and ecological food economy.

3.2.2 Create a good environment for the development of ecological food

First, increase ecological environment construction, and formulate relevant incentive mechanisms to support the development of environment-friendly agriculture. Second, improve the laws and regulations on ecological agriculture,

seriously deal with the production behaviors that harm the health of consumers, guide farmers to use less or give up the use of chemical fertilizers and pesticides, and ensure the green and safety of food from the source [6]. Third, based on the "industry-university-research" model, guide the application of the Internet of Things, blockchain and other technologies in food management, transparent information traceability, friendly production mode, fair and just market pricing, improve the social and economic benefits of ecological food, and achieve a win-win situation of ecological food economic development and environmental protection.

4. Conclusion

To sum up, food safety and the stable development of society has a close relationship. With the occurrence of food safety problems in recent years, people have a crisis of confidence in the country, also brought unnecessary economic losses. The emergence of block chain technology providing a new solution for food safety management, will be used for food origin tracking, product label inspection, market regulation, and other fields, which can reduce the operation cost of food supply chain, effectively solve the problem of food safety, more can improve the economic benefits of ecological food. However, the food supply chain tracking system based on blockchain is still in the stage of research and improvement, and it is necessary for all departments to increase cooperation and jointly formulate various measures to promote the development of blockchain technology and ecological food economy while giving full play to the role of blockchain in the field of ecological food safety management.

References

[1] Wang Ermei, Jia Xianwen. Research on the application of blockchain in ecological food safety management [J]. Business Economy, 2023 (04): 4-5 + 15.

[2] Huang Yanbin. Research on the application of blockchain technology in food safety management [J]. Food Safety Guide, 2022 (18): 48-50.

[3] Mao Junlan. Research on consumers' cognition of the application of blockchain in food safety management and its impact on purchase intention [D]. Jiangnan University, 2022.

[4] Tan Linyong, Ba Wenhao. Research on the relationship between food supply chain safety management, blockchain technology and food safety and quality—Take Xinjiang region as an example [J]. Straits Technology and Industry, 2021, 34 (08): 34-36.

[5] Que Jiwen. Key analysis of the application of blockchain technology in food safety management [J]. Food Safety Guide, 2020 (30): 156.

[6] Xu Jiping, Sun Pengcheng, Zhang Xin, et al. Blockchain-based information security management prototype system of grain, oil and food whole supply chain [J]. Journal of Agricultural Machinery, 2020, 51 (02): 341-349.