# Food Supply Chain and Blockchain Technology Based Agriculture

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***ABSTRACT:*** ***Blockchain is an emerging digital technology that enables distributors to connect financially across all elements without such intermediaries as banks. This article examines and summarizes present research and initiatives on blockchain-based agricultural and food supply chain consequences, challenges and promises. The study shows that blockchain is a good option for a transparent supply chain with a great deal of work on foodstuffs and food problems. This study highlighted that a number of firms and initiatives are building a reliable food supply chain with the participation of major players within the distribution chain utilizing blockchain technology. However, there are still some hurdles and issues which prevent farms and systems from making more appealing. The challenges are technical, educational, policy and regulatory frameworks. In the near future, research will show, in order to offer a safe, trustworthy and transparent approach, how government and trade actions should assure food security and integrity, as well as solve those issues.***

***KEYWORDS:*** ***Blockchain Technology, Farmers, Food Supply, Information Security, Mining, Supply Chain.***

## 1. INTRODUCTION

The pseudonymous writer Nakamoto wrote "Bitcoin: A Peer-to-Peer Electronic Cash System" for 10 years. The paper provides the basis for Bitcoin, the first cryptocurrency that allows trusted central authority such as banks and financial institutions to conduct confidential financial transactions. By creating blockchain technology, Bitcoin has addressed the dual issue (i.e. the digital tokens flaw as computer files can be simply duplicated or falsified). A blockchain is a digital register of transactions, which is supported by multiple computers by a trusted Third Party. In order to manage individually identifiable data transaction files, software systems allow for data transfer, translation, storage and display in readable form (blocks). Each block includes a header with a time stamp, transaction data and a connection to the previous block with the original Bitcoin setup. A hash is made on the basis of each block and is listed in the following header of the block. The change of a particular block therefore leads to incorrect hazards for the following blocks [1].

Researchers studied the issue of consensus carefully in previous years, but recently it was invigorated and inspired to be utilized in blockchain applications and led to new blockchain design concepts. The most commonly used work proof in Bitcoin requires computer nodes dubbed minerals to be redeemed before validating transactions. The first miner to solve this puzzle is a checked chain block, which receives a small transaction fee for transactions plus cash [2].

Proof of Work (PoW) is often criticized for the computer energy industry, which leads to higher price of hardware and energy and the resulting centralization issues and a huge environmental impact. The alternative approach is called the Proof of Stake (PoS), so that entities holding system coins can choose to be "stakeholders" in the course of approval of the transaction. Thus, PoS has the same impact as mining without using considerable energy and computer power (distributed consensus) [3].

Accordingly, several hundred digital tokens looked to resolve different weaknesses in main cryptocurrencies or targeted some fields such as health, gaming, insurance, agriculture and many more. The traditional banking system also examines Blockchain, which about 15 percent of banks use in IBM transactions (and sometimes accept them) [4].

Blockchain has increasingly used cryptocurrency and financial transactions since 2014, exploring several new applications, including handling and storing records and the authentication of digital signatures, intellectual and patent proprietary and patent rights, smart contracts and tracking of patent rights. Such advances have already transformed many sectors of business, government and society as a whole. But likewise new and anticipated strands can be created [5].

## 2. LITERATURE SURVEY

J. Becker et al. presented in the article that there is an all-encompassing hazard of infringements of information security. Recent privacy information from major businesses, such as Sony or Lockheed Martin has been obtained and addressed. For some purposes, asset safety is also jeopardized by targeted bottlenecks, viruses and malware, computers lost or stolen and mobile devices or by abuse of IT staff. They invest in security measures to avoid or at least decrease the possibility and consequence of information security violations in the interest of protecting businesses from threats to information security. As information security budgets are finite and the amount of assets to be secured is large, information security investments must be carefully assessed. Literature provides several methods for assessing investments in the security of information. This article is used to identify, compare and analyses such methodologies with examples of the policy and security management tool. This tool is designed to reduce management costs and improve the confidence of the organizations by using organizational rules and security structures. For the economic viability examination, for example, the policy and security configuration management system used cannot use any of the approaches evaluated without exception. Authors perceive substantial opportunities for new approaches in assessing information security investment in the integration of diverse components of existing techniques [6].

T. Lang et al. presented in the article that Brexit may have major food consequences. This assessment is valid, regardless of whether Brexit is "hard" or "soft." The UK food system is fully Europeanized to the preferences and prices of customers. This cannot be reduced or reduced by March 2019 without major implications. The food system in the UK is really confronted by problems of food safety. Food in 16 critical areas, Brexit might undermine UK food resilience and safety: What are the aims of any post-food future EU? Will they tackle the pressing challenge of environmental, social and public health sustainability? Will this be a transfer of EU legislation, with the Secretary of State sitting on his 'delete' button? British domestic production has increasingly diminished. The resilience of the UK food system should be improved. That is not the case. That's not the case. It is like a lad in the news who have no goals, no leadership and no significant Sourcing Ministries. Britain receives plenty of fruit and vegetables from within the EU which is vital for health. The pound's worth has decreased. Food price inflation has grown. Clarify what British customers say they wish to do, then link to the pre-March 2019 negotiations. The proponents of Brexit have ignored Britain's integrated dependence on pan-European institutions and make it suitable for food to be eaten in the UK, contributing to a wide range of scientific infrastructure. Customers were not warned from Brexit campaigners that US agri-commerce sells lower-standard goods or that the EU and US standards are weaker in foreign foodstuffs. The CAP and the CFP are the European Union's core and old policies. A lot, often with good cause, has been assailed in the UK. Brexit is a political building. It's not a formula for food insecurity. The study includes specific recommendations in each section on how to enhance food safety in the UK [7].

The CAP and the CFP are subject to a major policy vacuum. The new Secretary of State even rejected the CFP predecessor by declaring the London Fisheries Convention of 1964! No concept of policy save the assumption that farming and export pushes are enough and that the Coalition and subsequent Conservative Governments have ensured that the exclusion of 200 miles would resolve the unsustainable source of seaweed. What is farming and fishing? How many environmental services be mixed with food? These are significant climatic issues and ecological stresses.

### *2.1.Blockchain In Agriculture and Food Supply Chain:*

While Blockchain's technology has been successful in many cryptocurrencies, different agencies and others seek to make use of the openness and default tolerance they offer in order to address problems that are faced with the distribution of resources by many untrusted parties. Agriculture and the food supply chain are two important and extremely important areas. The agricultural and food supply chains are tightly intertwined as in many sectors agricultural output is almost always used as input in certain dispersed supply networks where consumers generally are the last customer. Agri Digital carried out its first sales of 23.46 tons of grain in December 2016 on a worldwide, successful blockchain. Since then, the cloud-based system has handled more than 1,300 clients and over 1.6 million tons of grain, with manufacturers paying USD 360 million. According on Agri Digital's success, this technology might be used across the agricultural supply chain. Agri Digital is already creating trustworthy and effective blockchain supply networks for agriculture

The food chain is constructed and scattered across the world with numerous players, including farmers, transportation companies, dealers and food suppliers. Currently this method is ineffective and unreliable. For example, if people buy goods locally, the origin or the environmental impact of the production is unknown.

Various initiatives have been developed to solve the genuine problems in the agricultural supply chain utilizing blockchain technology. The four main areas of these initiatives are: (a) food safety, (b) food safety, (c) food integration, and (d) support for small farmers.

### *2.1.1 Food Security:*

The FOA defines food safety as a "requisite for anyone to always have access to adequate, safe and nutritious meals which meet their nutrient needs as well as their preference to healthy living," says the Food and Agricultural Organization. In the middle of humanitarian disasters associated with environmental, violent political and ethnic conflicts, and so on, it was extremely difficult to achieve this aim. Blockchain is viewed as a chance for open international help to disrupt delivery processes, to verify and access papers and assets and maybe to respond more rapidly and effectively to humanitarian crises. In Jordan's camp, for instance, digital food vouchers were sent to Palestinian refugees using a bunch of coupons available in the Ethereum blockchain. The initiative is now supporting 100,000 refugees [8].

### *2.1.2 Food Safety:*

Food safety is required in order to avoid diseases in humans for hygienic food preparation, manipulation and storage. According to the CDC, 48 million Americans are contaminated by food each year while 3,000 die. In 2016, Oceana initiated a survey that revealed that 20% of seafood had not been marked properly. Lee et al. have noticed a decrease in confidence and high complexity in supply networks and vast shipping distances. With rising need for greater food traceability in terms of its safety and transparency, Blockchain might provide an effective response [9].

The first companies to use technology in their supply chains are example of Walmart and Kroger that examined technology for China's pork and Mexico mangoes.

The current idea to incorporate Blockchain into the Internet of Things is for physical data to be monitored in real time and the HACCP system to be tracked. This is highly important in order to protect the cold chain of spoilable food products. For example, Zeto Chain performs environmental monitoring on the basis of IoT devices at each link in the cold chain. Problems are detected in real time and quick action is instantly informed to the parties concerned. Intelligent contracts are used to improve sales and security of supply. Customers can use mobile applications to scan Zeto product labels to track the product history [10].

### *2.1.3 Food Integrity:*

The first objective is to use blockchain to trace cargill Agricultural conglomerates from the store on to their farms. In a recent blockchain experiment, turkeys and animal welfare are considered. In the sugar cane business, Coca-Cola tried to rob blockchains of forced labor. Carrefour European Food Company uses Blockchain to monitor and track the sources of the food in various kinds that include meat, fish, fruits, vegetables and dairy goods.

In addition, the research project Paddock to Plates aims at monitoring beef in the production chain and promoting Australia's reputation for its outstanding quality. JD.com's e-commerce website monitors beef produced and spread around the country in Inner Mongolia. Details on nutrition, murder and packing dates and the results of food safety tests may be scanned via the QR codes. Gog chicken uses a knee bracelet to show the free chickens of the customer, which makes it accessible online. Securing free customer spectrum. The company's objective is to build confidence by documenting the sources of food.

The Grass Roots Farmers' Cooperative features a blockchain technology meat subscription package to supply purchasers with confidential information on their pets. In April 2017, Intel also showcased the potential of Saw-tooth, the hyper leader, to increase the traceability of the seafood supply chain, as a production and management platform for blockchains. The study used sensor devices to collect information on fish location and storage conditions. The World Wildlife Foundation (WWF) stated in January 2018 that block shelling of the traceability of the supply chain blockchain can abolish illegal tuna fishing. In addition, the Balfegó initiative focuses on the traceability of tuna.

Furthermore, Rip.io has established the Food blockchain, the quality food network that monitors food transfers from production to the platform. The Origin Trail also allows consumers to grasp the actual value of the chicken business, the components in the soup, etc. The Blockchain Project for Agri-food has offered evidence

of the concept-based use of blockchain on table grapes in South Africa. Finally, a greenhouse farming framework based on blockchain technology, with improved security.

*2.1.4 Small Farmers Support:*

A strong strategy towards enhancing competition in developing nations is to support small farmers' cooperatives that help farmers obtain a bigger portion of the value of items they produce. AgriLedger employs distributed crypto-driven devices to establish trust in small cooperative enterprises in Africa. The objective of FarmShare is to create new forms of property ownership, collaboration between the community and an autonomous local economy. OlivaCoin is a B2B trade platform for reducing overall financial cost, enhancing transparency and making global markets easier to access. Several startup firms, like Provenance, Arc-Net, Bart.Digital and Bext360, enable smallholder farmers to find product traceability solutions. Accreditation is a test technology by the Soil Association, for instance with Provence which checks bio-food journeys.

Experts highlight that the previous actions might benefit even medium-sized farms, because they plainly differ from large enterprises. Cooperatives may, however, consist, and grow fairly significant, of small or medium-sized farmers. But they are an ideal basis for the blockchain, since their transparency may help to resolve discrepancies and disputes amongst farmers more easily and equally.

Summarizing, academics provide the instances supplied by blockchain technology/goods and/or product ventures. For each case, the last column lists the goals in blockchain. Financial issues relate in commercial ventures to food traceability.

## 3. DISCUSSION

*3.1.Potential Benefits:*

Blockchain technology provides numerous advantages, since it may be secure and disseminated amongst several respectable parties. This is a vital part of the food supply chain, which comprises a large number of actors from the raw materials to the retailer. A decentralized directory can be integrated with other programs by various rules (policies) and/or enhance traceability in value chains with diverse uses, inputs, suppliers, producers, purchasers and regulatory entities. The potential of Blockchain is to monitor social and environmental liability, increase sources of information, facilitate mobile payments, finance and credit, decrease transaction costs and facilitate the real-time, secure and reliable management of the supply chain.

As seen in the last section, Blockchain is particularly well suited for applications to help small farmers in the developing countries. Other options may include rural farmers' finance and insurance and transactions ease in undeveloped countries. Whereas farmers manufacture over 80% of items in developing countries, services like banking and insurance are not typically offered.

With respect to the industrialized world, smallholdings have always been constrained by contemporary problems, such as unanticipated prices and the environmental and economic impact of larger companies. Blockchain can support the whole value chain at a fairer price. Finally, prospective blockchain transparency might assist to develop famous trading platforms. The reputation of several other business platforms (e.g. eBay and Alibaba) enhances the behavior, responsibilities and commitment of the parties involved.

*3.2.Challenges and Open Issues:*

There are various hurdles and problems with future usage of blockchain technology. Small firms do not have the size, scale or competence needed for investing in the blockchain in the case study in the Netherlands. Furthermore, due to much uncertainty, legitimate commercial justifications are still lacking. There is a widespread dearth of information on training on the blockchain, and there are no training platforms. Farms must comprehend it correctly before they adopt blockchain. As farmers are sometimes unaware of state of the art technologies when they decide to cooperate globally on agriculture. The regulation is also a big hindrance. Existing cryptocurrencies, depending on existing experience and valuations, are subjected to speculators on a daily basis. Therefore, cryptocurrencies are not dependable for use in food supply chains without a sort of regulation as a complete solution. It is not clear how blockchain technology and monetary transactions still exist between policy makers and technologists. In addition, there are several design options for the current or expanding block chain. For example, limitless, open (that is, everyone may join), or systems should be permitted to (i.e. members trust), shutdown, etc. Present block chains experience significant scalability obstacles, because the present transaction processing is limited by features such as sizes and intervals of the transaction blocks. Although blockchain improves safety, there is only a grave risk of accidents involving the

loss of private keys by the account owner. Finally, the world of developed and developed skills and access to blockchain technology appear to be in a division. Many materials come from industrialized nations with a rich and well-structured primary sector (i.e. the USA, Australia, the Netherlands, etc.). In the use of big data in agriculture, too, this digital gap has been discovered. In sophisticated regions, such as the USA and Europe, the most continuing experiments tend to take place. The possible advantages and obstacles of blockchain agriculture are mentioned.

## 4. CONCLUSION

In this paper, a variety of organizations and projects use blockchain technology to build a proven and trusted food supply chain, including the participation of stakeholders in the distribution chain. There are still many challenges and barriers to overcome, not just at the technological level. It is necessary to simplify Blockchain. Different companies have created solutions that make it easier for farmers to use blockchain technology, such as 1000 Eco Farms who have united all major food, agricultural and farm blockchain operations which use Food Coin as the proposed ecosystem. In order to develop the potential advantages of the technology, government funding, education and formation are more focused on research and innovation to lessen obstacles to utilization. Gupta underlines the move towards blockchain amongst governments, emphasizing the need to monitor and understand the precise "pain points" and handle them properly. A series of policy measures may be taken, e.g. supporting growth in agri-food chain blockchain-minded ecosystems, technology support under the general competition improvement objectives and sustainable exploitation of the agri-food supply chain, and developing a clear regulatory framework for blockchain implementation. Blockchain is in short a promising technology for a transparent food supply chain, but there are still many obstacles and difficulties that hinder the wider call of farmers and food systems. It will soon be demonstrated if and how government and business initiatives can overcome these challenges in order to deliver a secure, reliable and transparent approach to food safety and integrity.

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