SURVEY ON FOOD TRACE USING BLOCKCHAIN

[1]Vaneeta M, [2]Sindu A.S., [3]Supreetha G,[4]Varidhi Madhuranath,[5]Vyjayanthi K.S.

[1]Associate Professor, [2,3,4,5]Undergraduates
[1]Department of Computer Science and Engineering,
[1]K S Institute of Technology, Bangalore, India

Abstract: Traceability is now transformed into a fundamental viewpoint in supply chain administration, especially in safety-sensitive businesses like food. Consolidating blockchain innovation into food traceability can move forward supply chain administration, brand notoriety, buyer certainty, quicken item improvement, and diminish obligation dangers. This review employs expressive and substance examination to inspect distributions related to blockchain and internet of things-based supply chains and traditional supply chains. To completely inspect blockchain-based supply chains, four well-designed questions are being proposed and tended to, specifically, the esteem of incorporating blockchain into supply chains, the fascination of researchers to specific supply chain topics, the improvement of inquiring about strategies, and outline sorts in receiving supply chain applications of blockchain, and the sorts of businesses included in supply chains that use blockchain. The review considers points to examine the present-day standing, potential uses, and succeeding proceedings of this technology in supply chain administration. The objective of the study is to give an overview of blockchain-based supply chain investigation, along with an overview of the current state of literature, and highlight the advantages and troubles in incorporating this ideology. Chosen compilations were reviewed to create an abstract of supply chains utilizing smart contracts and blockchain. This paper provides valuable data to assist researchers and professionals to probe the relevant points to quicken the improvement of blockchain-based supply chains.

Index Terms – Blockchain, Food Supply Chain, QR Code, Smart Contracts, Traceability

I.   INTRODUCTION

In the last few years, the expansion of investigation, ventures, and dialogs concerning shared ledger technology has progressively pulled in the thought of analysts and professionals. The rationale is the features that it provides, such as upsetting the existing structure of centralized frameworks. It alludes to an uninterrupted record of time-stamped records successively connected using cryptography. This makes it a permanent, secure, and trustful show where exchanges among parties are concerned. A few topics have been in the last few years, the expansion of investigation, ventures, and dialogs concerning shared ledger technology has progressively pulled in the thought of analysts and professionals. The rationale is the features that it provides, such as upsetting the existing structure of centralized frameworks. It alludes to an uninterrupted record of time-stamped records successively connected using cryptography. This makes it a permanent, secure, and trustful show where exchanges among parties are concerned. A few topics have been explored utilizing this concept and supply chain administration is one of the developing applications. In this paper, a study on conventional and blockchain-based systems is done that describes some of the supply chain obstacles. The goals and inspiration in the reviewed publications are distinguished highlighting the results of the system used. To solve many issues regarding the supply chain, information is needed to be unchanging as well as open. Blockchain could be an encouraging innovation having the capability to fulfill numerous supply chain challenges.

Supply Chains include different members and partners and various forms in different stages. Any process in a supply chain consists of a sequence of individual steps, which shall be described by a manageable number of general activities [12]. They have ended up more worldwide, complex, and interconnected over stages. Fig 1. underneath portrays the occasions and substances that take a portion in a commonplace nourishment supply chain.
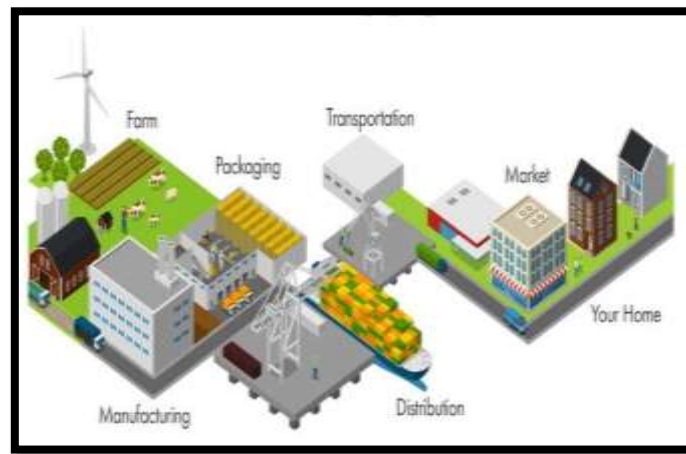
Fig. 1. The Food Supply Chain

Firms point to addressing the expanding supply chain complexity by embracing distinctive advances such as RFID, GPS, barcodes, and QR codes to straightforwardly collect data from the forms and stages of the supply chain. Giving straightforwardness and belief among members and partners and guaranteeing a proficient operation are present-day supply chain troubles. Even though companies utilize information collection techniques as mentioned earlier, data related to supply chain mechanisms and replacement of item proprietorship should be versatile to inadvertent or purposefulness adjustments. Besides, supply chains must give visibility so that partners may gain information concerning the position of the supply chain. Present supply networks ought to be very dependable than before. Disturbances within the supply networks could make noteworthy misfortunes in businesses and increment prices for conclusion customers. Businesses and clients are raising modern requests for data on an item, such as genuineness, root, quality, and feasibility. These requests pertain to the concerned product's supply chain.

A systematic literature review (SLR) was done to examine the aspects in detail to look into the points referring to the connected issues. The point of utilizing SLR was to show a common outline of inquiries by analysis of extant writing. The earliest surveys conducted are not satisfactory for giving a common outline, and a writing overhaul is essential owing to the fast multiplication of supply networks that use blockchain. The requirement for stating the ongoing situation and the developing demand for blockchain over diverse businesses within the SCM setting was recognized. A synopsis of the existing publications on blockchain for the supply chain was performed. Since the successful administration of supply chain operations taking place through progressed arrangements is of most importance, adopting an ingenious way instead of giving informal solutions plays a basic part in the acceptance of blockchain technology. The paper is organized as follows: Section I was the introduction. Section II gives an overview of the literature review. Section III outlines the problem statement. Section IV describes the objectives of our project. Section V presents a brief overview of the Bread supply chain methodology. Finally, Section VI concludes the paper.

II.   LITERATURE SURVEY

In this section, related writing on blockchain applications for food supply chains is surveyed and highlighted. The writing on blockchain applications has expanded consistently in keeping money, back, and protections, but the writing on nourishment and agribusiness remains meager and is a fair beginning to pick up notoriety.

Paper [1] talks about how food security could be a basic issue in today's world. The routine agri-food era system does not offer straightforward traceability of the make at any point of the supply chain, and hence, during a food-borne scene, it is outstandingly troublesome to channel through food era data to track make and the starting of the scene. In afterward a long time, the blockchain-based food era system has settled this challenge; in any case, none of the proposed methods makes the food generation information easily open, traceable and obvious by customers or creators utilizing mobile/edge contraptions. In this paper, it's proposed with a FoodSQRBlock (Food Security Quick Response Piece), a blockchain technology-based framework that digitizes the food period information and makes it successfully open, traceable, and obvious by the clients and producers by utilizing QR codes. A proposed large-scale integration of FoodSQRBlock inside the cloud to seem the plausibility and flexibility of the system, as well as permit a test appraisal to illustrate this.

The globalized era and the scattering of cultivating era bring a re-established center on the security, quality, and the endorsement of some imperative criteria in cultivating and food supply chains. This paper [2] describes the creating number of issues related to food security and debasement threats has set up a colossal requirement for a fruitful traceability course of action arrangement that acts as an essential quality organization instrument ensuring palatable security of things inside the rural supply chain. Blockchain may be a troublesome advancement that can grant a creative course of action for thing traceability in cultivating and food supply chains. Today's agrarian supply chains are complex situations counting many accomplices making it ungainly to endorse many vital criteria such as the country of starting, stages in trim enhancement, conformance to quality benchmarks, and screen yields. In this paper, it is proposed an approach that leverages the Ethereum blockchain and sharp contracts to productively perform commerce trades for soybean taking after and traceability over the provincial supply chain. Our proposed course of action slaughters the prerequisite for a trusted centralized master, go-between, and gives trades records, updating viability and security with tall perception, immovable quality, and security. The proposed course of the action centers on the utilization of sharp contracts to supervise and control all intuitive and trades among all the individuals including the interior of the supply chain natural framework. All trades are recorded and put absent inside the blockchain's changeless record with joins to

a decentralized record system (IPFS) thus giving to all a tall level of straightforwardness and traceability into the supply chain natural framework in a secure, trusted, strong, and successful way.

The nourishment supply chain segment as depicted in this paper [3] has been progressively globalized in later a long time. As a result, nourishment security and quality certification from cultivating to fork have ended up progressively imperative. Developing challenges to nourishment security and defilement have required the improvement of a novel traceability framework, a vital quality control instrument that guarantees satisfactory nourishment supply chain item security. A blockchain-based arrangement in this paper that kills the requirement for a secure centralized structure, middle people, and data trades, moves forward execution and follows to a tall level of security and astuteness. The utilization of savvy contracts to screen and oversee all communications and exchanges interior the supply chain organized among all parties is central to our methodology. All exchanges are logged and spared in a centralized interplanetary record framework database, and this strategy checks them all. It gives partners a secure and cost-effective supply chain framework. As a result, the recommended show makes a supply chain framework that's straightforward, precise, and traceable. The proposed strategy encompasses a throughput of 161 exchanges per moment and a meeting time of 4.82 seconds, and it was appeared to be compelling in rural item traceability.

Fran Casino et.al paper [4], nourishment, pharmaceuticals, and other safety-sensitive businesses have made traceability a vital component of supply chain administration. Upstream (producers, makers, etc.) and downstream (merchants, wholesalers, etc.) supply chain performing artists must store and oversee traceability-related information in arrange to illustrate administrative compliance to state specialists and more requesting clients. Customers have tall desires of nourishment supply chains (FSC), with a specific center on security issues. The scattering and complexity of current FSC systems, on the other hand, work as barricades to the creation of sound traceability strategies. This ponder creates and tests a disseminated trustless and secure engineering for FSC traceability. A nourishment traceability case considered from a dairy company is displayed to test the common sense of the proposed approach. The usage of completely utilitarian savvy contracts and a neighborhood private blockchain encourage illustrates the model's convenience. The numerous associations between the recommended blockchain-based approach and its administrative results are too examined. The proposed models in general merits are investigated, as well as promising subjects for future research. Both specialists and analysts will advantage from the discoveries.

Relating in this paper [5] the self-evident tall recurrence of nourishment security episodes and the globalization of nourishment consequence and trade circulation, building up a nourishment traceability framework is basic. Grain includes a longer supply chain, including numerous more joins and even more complicated components, making it difficult to realize traceability in a single unit, because it does with meat items; since grain features a longer supply chain, including numerous more joins and indeed more complicated variables, it is simple to cause data detachment. This paper has completed the taking after errands in reaction to the previously mentioned issues: To move forward grain traceability precision, to begin with, propose an RFID-based grain supply chain traceability show, which fundamentally depicts the data stream and grain stream within the grain traceability framework; moment, utilizing the GTIN coding standard within the GS1 framework, a arrange traceability code is set for each group of grains at each interface, giving a strategy for extraordinarily distinguishing the bunch of grains at that connect. Besides, the Display calculation and the format-preserving calculation are utilized to scramble the traceability codes of each interface and build the last traceability code, permitting buyers to investigate around all the exact data approximately the grain within the supply chain through a traceability code. At long last, the recommended traceability component was subjected to a security and execution consideration. The discoveries uncover that the proposed plot is both secure and compelling, guaranteeing the security and traceability of the grain supply chain's traceability framework.

Hundreds of millions of individuals around the world are at the hazard of expending sullied nourishment. The productivity and adequacy of nourishment supply chains must be made strides instantly. By 2050, the world's populace is anticipated to have developed to at slightest 9 billion individuals, devouring up to 70% more nourishment than it does right now and requiring nourishment generation and conveyance to ended up significantly more maintainable. Nourishment security has ended up an around-the-world concern as a result of many food-related embarrassments. The capacity to track and follow things from fork to cultivate develops more troublesome as supply chains ended up more worldwide and complicated, however, it remains basic. Traceability can offer assistance to decrease the fabricating and conveyance of unsafe or low-quality products. It empowers the item to be focused on within the occasion of a nourishment security issue, minimizing exchange interference and any potential open wellbeing results. This article [6] aims to embrace a total examination of nourishment supply chain traceability strategies and innovation.

Customer certainty inside the food they exhaust has been undermined by many rates of food degradation, blackmail, and foodborne contamination flare-ups. To preserve buyer certainty, the Nourishment Supply Chain (FSC) accomplices must create a worthy traceability framework in their supply chains. The objective of this thing is to distinguish the drivers (primary components) that contribute to the successful usage of the FSC traceability framework and to survey the causal joins that develop. Through a writing audit [7] and master supposition, twelve drivers for the arrangement of the FSC traceability framework have been recognized. To analyze this intelligence among the drivers agreeing to their net impact, the grey-based

DEMATEL strategy is recognized. These drivers were too positioned agreeing to their noticeable quality and impact score. This considers proposing that the drivers are separated into two categories: powerful and impacted. Four of the drivers are individuals of the affecting gather, whereas the other eight are individuals of the affected bunch. The foremost vital driver is "nourishment safety and quality," which encompasses a major effect on the arrangement of a traceability framework. This consider can serve as an establishment for creating a system for actualizing a traceability framework within the FSC, as well as helping policymakers and specialists in recognizing and assessing drivers for actualizing a traceability framework within the FSC. This archive too gives professionals and directors valuable data and bolster in making choices on traceability usage.

This paper [8] discusses, one out of each ten people ended up wiped out from eating polluted nourishment, concurring to the World Wellbeing Organization (WHO). Nourishment supply chains are getting to be more delicate as a result of complex nourishment fabricating forms and globalization. In later a long time, an assortment of innovations has been inquired about to illuminate nourishment frailty and make strides in memory proficiency. Blockchain is one of the foremost promising innovations, having been viably utilized in money-related components such as bitcoin and drawing intrigued from nourishment supply chain companies. Since blockchain contains qualities like decentralization, security, unchanging nature, and shrewd contracts, it is likely to progress nourishment supply chain management and traceability within the long run. Content-analysis-based writing consider is used in this paper to look at blockchain selection within the nourishment supply chain. It offers four preferences.

III.   PROBLEM STATEMENT

The problem statement is identified as:
"To design and develop a secure and tamper-proof application for food supply chain management and provide traceability using blockchain."

Blockchain has been revolutionizing and transforming the supply chain of major industries, one such is the food industry. Worldwide the supply chain is facing challenges today and will face them tomorrow. Traditional systems nowadays would not offer easy traceability of the product at any time, due to this there will be a slowed down communication. In recent years, a few BBTS are rehearsing blockchain to an extent to gain real-time and end-to-end visibility into their supply chains. Here, the idea is to execute a small-scale traceback with specific constraints tagging along with it to provide beneficial traceability.

IV.   RESEARCH METHODOLOGY

After considering the food supply chain space, specifically, around the bread supply chain. It is known that all the nourishment supply chains begin from either one or more essential source(s), deliver a primitive source and after that, the commodities are transformed a few times until the ultimate item has been gotten. All these changes and related occasions take put in different stages of the method.

Utilizing investigation procedures, examination of this chart is performed to decide the performing artists, concepts, substances that rise and reoccur in this sort of framework.

Fig. 2 outlines the stages involved in the development of food trace with the blockchain project. It has three phases, namely

- Physical flow,
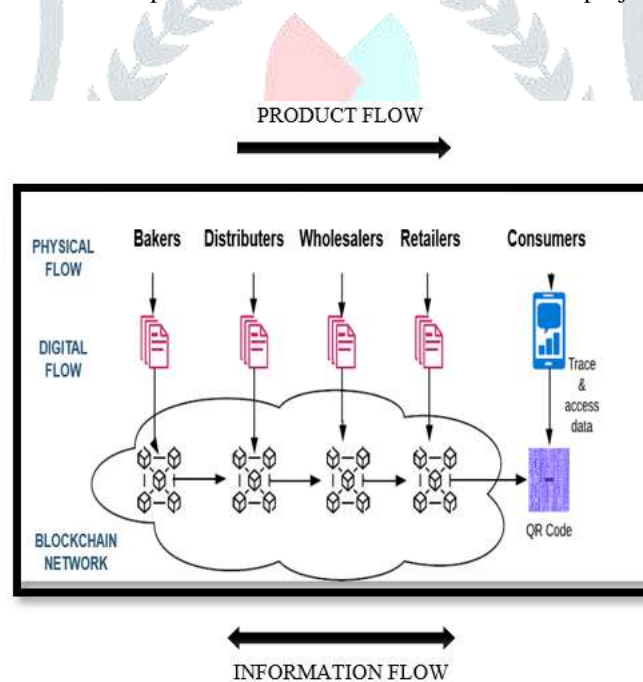- Digital flow,
- Blockchain flow

Fig. 2. Flow of the Supply Chain

Each stage that appeared is critical here in its own manner. In general, the concept of the quality of a food product is an articulated concept, which can be defined differently by the various actors [9].

First, comes the physical layer. This layer comprises distinctive substances within the nourishment chain and tells us how the item is being passed. Note, the stream within the product is unidirectional and moves as it were forward within the supply chain but the data stream is bidirectional that moves both ways.

The different actors in the chain are:

- Bakers
- Distributors
- Wholesalers
- Retailers
- Consumers

Bakers- Pastry specialists yield the create and turn it into the ultimate item at that point the bundling is done. Amid the bundling QR, CODE ids are created at the side of the package.

Distributors- After naming, it is discharged for dissemination to another person.

Wholesalers- Buys the target merchandise in huge amounts to offer them to supermarkets. Wholesalers can keep an eye on stock and request up and down the supply chain to form beyond any doubt products move appropriately.

Retailers- In this stage the retailers purchase the target merchandise to offer them to the conclusion client. Retailers can make beyond any doubt they are offering the freshest nourishments possible.

Consumers- The buyer is the end-user of the food supply chain they purchase the item and as a rule, confirm the traceability and get to other important information about the item.

Now comes the digital data flow layer, wherein, after distinguishing the performing artists the stream and the occasions related to the method the framework savvy contracts are made in our system. Smart Contracts (SCs), are little script programs running on each hub of the blockchain. SCs are unchanging, no one can alter the code of the contract and conveyed, because of their capacity interior the blockchain.

These contracts contain each substance upgrading almost the item. Bakers upgrade almost the clump number of bundled bread beside the title and address of the holder. Following merchant's upgrades on when they have gotten the bundle bread with the shipment date and numerous other points of interest. Like that each of these wholesalers, retailers overhaul their portions and stores on the blockchain.

The final layer is the blockchain organize wherein the advanced information is prepared on the Web utilizing blockchain innovation which once more is utilized for finding and getting to. In a BC, every transaction between two participants is recorded permanently and these records take the name of *blocks*, whereas each computer that is used for BC processing is called *node* [10].

Exchanges that are put away on a blockchain are seen as records in a square, the square moreover contains a timestamp and a hash that interfaces it to the past square shaping a chain of squares that cannot be altered. The following perspective here is the QR code. A QR code may be a 2- dimensional standardized tag with a bigger information capacity than a 1-dimensional standardized identification as a standardized identification can be filtered to recover extra data or to be coordinated to a website/application with more data almost the item origin. When the shoppers check the QR code it performs a hash work on the data from the past square and compares the esteem with the hash esteem brought from the QR code in case the hash esteem matches at that point it implies that the data around the item is authentic. So, after checking the QR code the consumer is shown with the data in conjunction with the other points of interest of the item.

V. CONCLUSION

This paper looks at the effect of executing Blockchain innovation on the bread supply chain by including prospects for industries and concerted efforts that are necessary to explore sustainability themes. The dissemination of the Blockchain network advances the simpleness and following of products and services in the This paper looks at the effect of executing Blockchain innovation on the bread supply chain by including prospects for industries and concerted efforts that are necessary to explore sustainability themes. The dissemination of the Blockchain network advances the simpleness and following of products and services in the bread supply chain. From analyzing the literature analysis, this study makes an important contribution to the comprehension of Blockchain applications in SCM and lays out a blueprint for their implementation. Consequently, the obtained findings offer academic and practical insights into the ambiguous, insufficiently explained, tensions and conflicts between BT and logistics and supply chain contexts.

To enrich the research scope, future efforts have been highlighted regarding technical diffusion and integration of block-supply chains. With this arrangement, a proposed system eliminates the need for a trusted centralized expert and mediators, and enables the exchange of exchange records, thereby increasing proficiency and security with astuteness, unwavering quality. With an extensive number of focal points and adaptability, particularly in terms of traceability, Blockchain in the nourishment industry can be an enormous arrange.

VI. ACKNOWLEDGEMENT

REFERENCES

[1] Somdip Dey et.al, "FoodSQRBlock: Digitizing Food Production and the Supply Chain with Blockchain and QR Code in the Cloud", Sustainability 2021, 13, 3486, https://doi.org/10.3390/su13063486 22 March 2021

[2] K. Salah et al., "Blockchain-Based Soybean Traceability in Agricultural Supply Chain", IEEE ACCESS, Volume, Digital Object Identifier 10.1109/ACCESS.2019.2918000,7 May 20,2019

[3] Deepak "Blockchain-Based Traceability and Visibility for Agricultural Products: A Decentralized Way of Ensuring Food Safety in India", Sustainability 2020, 12, 3497; doi:10.3390/su12083497, 24 April 2020

[4] Fran Casino et.al," Blockchain-based food supply chain traceability: a case study in the dairy sector", International journal of production research, DOI 10.1080/00207543.2020.1789238, 23 Jul 2020

[5] MiaoLei Deng et.al," Research on a Traceability Scheme for a Grain Supply Chain", Journal of Sensors, Volume 2021, Article ID 8860487, 9 pages, 18 January 2021

[6] Samo Kumperščak et.al, "TRACEABILITY SYSTEMS AND TECHNOLOGIES FOR BETTER FOOD SUPPLY CHAIN MANAGEMENT", QPI 2019, volume 1, DOI: 10.2478/cqpi-2019-0076, pp. 567-574,6th May 2019

[7] Abid Haleem et.al, "Traceability implementation in food supply chain: A grey-DEMATEL approach", The Journal of the China Agricultural University, Volume 7,23 January 2019

[8] Yunchuan Zhang et.al, "A Content-Analysis Based Literature Review of Food Traceability in Food Supply Chain", International Journal of Environmental Research and Public Health,17, 9 March 2020

[9] Luisanna Cocco et.al, "A Blockchain-Based Traceability System in Agri-Food SME: Case Study of a Traditional Bakery",IEEE Access, Digital Object Identifier 10.1109/ACCESS.2021.3074874, April 15, 2021

[10] Niccolò Patelli and Mauro Mandrioli, "Blockchain technology and traceability in the agrifood industry", Journal of Food Science, Vol. 85, Iss.11, DOI: 10.1111/1750-3841.15477, 2020

[11] Martina Thumea et al.," Blockchain-based traceability in the food industry: requirements analysis along the food supply chain", DOI: 10.31219/osf.io/uyb64, Mar. 2021