FOOD SAFETY USING RFID TAGS IN BLOCKCHAIN TECHNOLOGY

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Abstract

Food Safety is largely important for any society because food is the major source of living. Also, there is an inherent lack of trust in the food sector. One simply cannot determine if the vegetables or meat that he/she is picking off the shelves of the supermarket aren’t genetically modified or not. Sure, one could manually trace back all records of the item in question and arrive at the decision, but that would take days upon days of unworthy effort. Thus, the consumption of such products is vulnerable to several diseases. Diseases transmitted through contaminated food are a persistent concern, not only for each one of us but also for governments. This article explains the influence of Blockchain in Food Safety. Implementing this technology in edible products makes food traceability possible, tracking products to their source for enhanced food authenticity and safety. Although the term Blockchain is widely known and Blockchain’s frameworks are finding applications in a variety of fields such as the Internet of Things, Artificial Intelligence, Banking, and healthcare; its framework can also be implemented to trace each processing stage of a food product. A ledger framework that consists of blocks where each block containing the information of each process state, will help the consumer to track the authenticity of the food product. If any product defects in any particular process, it can be easily identified by using this framework. This framework is implemented by a combination of RFID (Radio Frequency Identification) and Blockchain Technology.

Keywords: Blockchain, Ledger, Framework, Traceability, Authenticity, Food Safety, RFID

I. Introduction

With the vivacious headway of India's economy, person's lifestyle has been improved persistently, however the fundamental requirement forever, nourishment is being tested these days by overall points of the nourishment inventory network.
Sanitation manages to defend the claim national nourishment give chain from the presentation, development or endurance of bold microorganism and compound operators. India is truly growing as of now and its monetary benefit, framework, per capita monetary profit has conjointly created. be that as it may, most significant declination looked by the country is that the drawback of nourishment the board and its dissemination.

A nation like India consolidates a “genuine” hunger drawback and positions one hundredth out of 119 nations on the globe craving record behind the Democratic People's Republic of Korean Peninsula, Bangladesh and Republic of Asian nation (Global Hunger Index 2017). India is that the second-biggest maker of rice, wheat, sugarcane, cotton and groundnuts, and still the second-biggest foods grown from the ground maker, representing 10.9% and 8.6% of the overall leafy foods generation, around the world, anyway it's the second-most elevated under-sustained populace around the world. In India, sanitation and security could likewise be a developing worry with rising episodes of nourishment pollutions, that if keep unnoticed can cause fluctuated wellbeing perils, disease, flare-ups, and even passing, for sure, it influences India's financial standing. a scope of compound, natural and physical perils unit of estimation the chief fundamental reasons for nourishment inquiries of wellbeing. Among these the being contaminants, natural contaminants alongside concoction deposits, mycotoxins and adulterants are supposed to be responsible for delivering huge scale flare-ups of unwellness and littler occurrences.

In view of the above existing affliction, this diary is to decide partner degree agri-nourishment production network discernibility framework bolstered RFID and blockchain innovation for serving to Indian agri-nourishment markets to strengthen their sanitation and quality, at consistent time, to impressively decreasing the misfortunes all through the stockpiling strategy. the remainder of the paper is composed as pursued. This paper will at first spotlight on the use and advancement of RFID (Radio-Frequency Identification) and blockchain innovation, at that point break down the advantages and disadvantages of RFID and blockchain innovation in building the agri-nourishment store network detectability framework. This paper will utilize speculations of information science, the board science, framework science and request ways, making utilization of thinking, examination, hypothesis and showing of investigation approach to survey the Blockchain inside the nourishment give chain. At the highest point of this paper, one will see the detectability with dependable information inside the whole agri-nourishment give chain, which may successfully ensure the sanitation, by get-together, moving and sharing the credible data of agri-nourishment in warehousing, creation, handling, circulation and selling joins.
II. Background and Related Work

II.i. Definition of RFID

RFID (Radio Frequency Identification) may be a non-contact programmed identifying proof correspondence innovation. It will exactly decide varied, fast-moving articles at the same time even beneath poor surroundings and keeping in mind that no manual mediation. In addition, it can tag, spare and supervise knowledge of articles through a radio-recurrence signal. Contrast with the Universal Product Code, RFID label innovation joins a large quantity of benefits, almost like comfort, ecological condition, mass-limit info and serviceable. In the stock house, RFID has been wide used current handling, distribution centre administration, provide pursue, and merchandise hostile to counterfeit, then on with the intense uses of RFID, the degree of giving chain the board has been implausibly improved.

II.ii. Application of Radio Frequency Identification in the Food Supply Chain

Radiofrequency identification is an element of the family of Automatic Identification and knowledge Capture that include 1D and 2nd bar codes. RFID utilizes associate electronic chip, typically applied to a substrate to create a label, that is glued to a product, case, and different packages. the knowledge it contains could also be scan, rewritten and/or recorded. This adds a novel symbol and on-line property to each nutrient such grocers, restaurants and food suppliers will frequently improve their inventory management, efficiency, traceability, property and conjointly client satisfaction. Early in 2008, the Europe Union has passed the legislation to pressure placental farm to use RFID for sheep. Then the world’s prime 2 countries within the advancement of technology USA and Japan; RFID system had been used for pursuit agri-food inside the whole provide chain from cultivating to the distributor and merchandiser. In these chain processes, RFID systems offer the reassurance to manage the information and secure the knowledge of agri-food for the producer, wholesaler, merchant, and client.

Another example of the applying is that throughout the year 2008’s Olympic Games, RFID technology had been used for pursuit and observation the food issued. Athletes and players would possibly get the data regarding the food they eat, further as what types of food they were eaten; wherever the food is created and what processes these foods have seasoned, by their RFID tags. due to RFID technology, the whole provide chain management crammed with happiness for tracing and observation of "farmland to hand", and once the food regarding safety queries arises, by victimization this technology ar able to understand their provide and solve the matter directly. Thus, this technology helps within the interference of counterfeit merchandise within the provide chain.

II.iii. Awakening of Blockchain Technology

The quintessence of the blockchain could be a specialized subject of solid information that is conjointly kept up by the way of the confined and trustless
This specialized topic may deliver hindrances through any scope of the hubs inside the framework by exploiting cryptography. It’s like what the name says: a grouping of squares. Each square contains the information of all exchanges inside the framework inside a sum, and it might create a computerized procedure which may be acclimated confirm the legitimacy of the information and interface with a progressive square. The conveyed data made by blockchain innovation contains a fundamentally totally unique computerized spine. This can be conjointly the preeminent particular and essential element of blockchain innovation.

A blockchain record comprises of two significant sorts of records, singular exchanges and squares. The essential square comprises of a header and information that relates to exchanges occurring at interims a gathering sum. The square's timestamp is utilized to help produce an alphameric string alluded to as a hash. When the essential square has been made, each subsequent square inside the record utilizes the past square's hash to compute its new hash. Before a shiny new square perhaps another to the chain, its authenticity ought to be confirmed by a procedure technique alluded to as accord blockchain normally approval. As of now inside the blockchain technique, a lion's share of hubs inside the system ought to concur the new square's hash has been determined appropriately. Accord blockchain guarantees that each individual duplicate of the circulated record shares a comparative state.

When a square has been embedded, it might be recorded incoming about squares, in any case, it can never be adjusted. On the off chance that someone makes an endeavour to swap out a square, the hashes for past and coming about squares will alter and upset the record's shared state. When agreement isn't any more drawn out achievable, various PCs inside the system mindful that a retardant has happened and no new squares will be another to the chain till the issue is settled. Ordinarily, the square dispensing the mistake will be disposed of and furthermore, the accord blockchain strategy will be consistent. Specialists state many key edges to blockchain innovation. Security is considered one in every of the numerous advantages of this innovation. It's for all intents and purposes unrealistic to degenerate a blockchain because of information is shared and much of the time accommodated by thousands, even boundless PCs, and blockchain has no single reason for disappointment. On the off chance that one hub goes down, it is anything but a take because of all the contrary hubs have a copy of the record.

II.iv. The Approach of Food Traceability System by Radio Frequency Identification and Blockchain Technology

The nourishment things, for example, new organic products and vegetables and meats which incorporate pork, sheep, chicken and hamburger can be utilized to check its genuineness utilizing the two innovations. The nourishment inventory network recognizability framework which we are going to fabricate predominantly depends on Radio Frequency Identification innovation to actualize information procurement, dissemination and partaking underway, handling, warehousing, dispersion and deals connections of the agri-nourishment store network.
Other than that, it likewise utilizes blockchain innovation for ensuring the data shared and distributed in this discernibility framework is dependable and bona fide. Consumers today wish total transparency in their food provided to them, they wish to know who what where and how the food they eat is processed. The intelligent RFID label will help in the food sector to modify firms to verify a food item’s journey across the whole supply chain, from its initial supply stage to its final destination, and pinpoint any hassle spots on the manner, minimizing risk and price. The following pictorial representation will illustrate the visionary of food supply chain traceability system using Blockchain and RFID technology.

There are numerous different advances other than RFID and Blockchain which can be productively utilized in this discernibility framework, they are WSN, GPS, and GIS. The GIS (Geographic Information System) can be utilized together with RFID to catch, store, control, examine and track the generation of any nourishment item.

**Fig: RFID and Blockchain Working Procedure**

GPS (Global Positioning System) can be utilized to make the vehicle situating and ideal appropriation course for dispersion vehicles or trucks. WSN (Wireless Sensor Network) can be utilized as a committed sensor for checking and recording the physical states of the earth and sorting out the gathered information at a focal area. All these assurances the wellbeing and nature of the nourishment and actualize the exact reviewing and capable examination for the deficient item. Through and through this
recognizability framework could understand the data distinguishing proof, request, following, following, and so forth for the entire inventory network, consequently making it straightforward and detectable for every one of the individuals in this industry.

III. Advantages and Disadvantages Food Supply Chain Traceability System

III.i. Advantages of Food Supply Chain Traceability System

1. Fast Tracking and Tracing of Defective Food Product

The advantage to pursue and recognizability the executives' Agri-nourishment offer chain detectability framework fabricates a type of agri-nourishment data chain that covers the sanitation administering controller, ranch, livestock ranch, handling venture, arrangement endeavour, deals undertaking (general store) and customer. Besides, wishing on the blockchain framework, every one of the information of the agri-nourishment inside the offer chain is clear and open, in this way arrangement endeavour may actualize period pursue for the agri-nourishment item, overseeing controller may execute recognizability the board and obligation examination for blemished item, customer may get the all-out data of the item inside the whole agri-nourishment offer chain, that region unit accommodating to decide a sound market setting.

2. Benefactor for the Government and other Third-Party Organizations

Right now, a large portion of the RFTD-based inventory network detectability frameworks territory unit all upheld the idea of utilizing an incorporated framework with the govt. division or an outsider association to accomplish data straightforwardness on the arrangement chain. In any case, these styles of incorporated associations territory unit totally murky and the client can ne'er have the option to capture the internal subtleties of the exchanges. this may bring about data falsification and coercion for offer chain individuals. By abuse blockchain, this as of now detectability framework expels the need for a trusty brought together association is a data stage for every one of the individuals in it with receptiveness, straightforwardness, impartiality, steadfastness, and security.

3. RFID & Blockchain-Based Traceability System is Much Superior and Fast Than the Existing

Centralized Traceability System

In the current concentrated discernibility framework, the inventory network individuals have certainty partner degree information managing focus to move and share their data, that satisfies the learning and viewpoint of the total production network. This brought together detectability framework successfully executes the learning sharing and, somewhat, understands the recognizability the board inside the entire agri-nourishment inventory network. Be that as it may, the incorporated framework is defenceless against breakdown, since a solitary purpose of breakdown will lead the entire framework to be slammed.
The data information of the item could be encoded and ensured by restricting the item with an interesting TD of RFID tag, which could shield the item from falsifying. Besides, by applying RFTD, numerous sorts of agri-nourishment data can be included in the recognizability framework through insightful hardware. Since this procedure needn't bother with any manual activity, significantly decline the errors brought about by human elements. In addition, by utilizing blockchain innovation, every one of the individuals in this framework can't control agri-nourishment data, which further builds the security and nature of the item.

4. **Fight Against Counterfeit Products**

    The data of the product can be encoded and protected by restricting the product with an RFID tag, that may shield the product from falsifying. Additionally, by applying RFTD, a few types of agri-nourishment information are supplemental into the recognizability framework through wise instrumentality. Since this technique doesn't might want any manual activity, significantly decline the slip-ups brought about by human components. Moreover, by developing blockchain innovation, every one of the individuals during this framework region unit unfit to oversee agri-nourishment data, that more will expand the insurance and nature of the product.

III.ii. **Disadvantages of the Food Supply Chain Traceability System**

1. **Higher Expense of RFID**

    RFID comes in a few unique sizes, can be little enough to join to bundle marks, and adjusted to endure certain particulars for stock. The principal impediment to utilizing RFID programming is cost; with a standardized identification, you can deliver one for around one penny. Right now, an RFID label will cost you more than 12p a piece in any event. Another hindrance is that while they stand up well to the component's RFID labels can be meddled with by metals and fluids when you are attempting to understand them. Now and again, they must be put in a specific area on various kinds of item, which can be a brief period devouring. With an RFID tag, you can't peruse only each in turn as you can with a scanner tag. The peruser will examine every one of the labels it grabs in extends immediately. These sorts of labels are as yet being grown so be careful when you buy a framework it could be outdated soon, and you are going out on a limb. Another burden of utilizing them manages their programming speed, which takes significantly additional time than setting up a scanner tag.

2. **Drawbacks of Blockchain Technology**

    Blockchains utilize over the top vitality. Contending excavators and mammoth mining ranches consume an unbalanced measure of power when contrasted with the result, the formation of the following square. In this present reality where current vitality age is an atmosphere issue, blockchain handling doesn't bode well. Blockchain sections don't keep going forever or are not permanent. Versatility remains blockchain's shortcoming.

    Every one of the records executed utilizing blockchain has a well-actualized structure and some are the best. However only one in every thousand individuals on the
planet utilizes it. Given its exchange preparing speed, fundamentally expanding the
number of dynamic clients isn't useful. Blockchain isn't indestructible, it might appear
that on the off chance that a blockchain is put away on each system hub, at that point
unique administrations or specialists can't close down a blockchain. In the event that no
brought together server or control direct, at that point there is no place to go to close a
blockchain. The test here is keeping away from fixation. A blockchain is just as
indestructible as its scattering. In the event that, state, over half of diggers or suppliers
of blockchain processing administration exist in one nation, that nation's specialists can
forestall indestructibility – for instance by cutting off correspondences or power or
appropriating server ranches. As an enlivening innovation, blockchain is still in its
underlying stage and there are gigantic hindrances and deviations to its future
applications. In this manner, Blockchain is still at its juvenile state.

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