



# A Proof of Concept of Farmer to Consumer Food Product Traceability for Local Communities

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**ABSTRACT**-The recent epidemic emphasises the significance of transferring high- quality products from original directors to guests. Growers have traditionally reckoned on mediators to vend their goods, which results in occasional price inequity and a lack of direct engagement with guests who may be interested in knowing further about the fruit they consume. This composition presents a conception for a block chain- grounded food traceability system allowing original growers to vend product to health-conscious consumers who can trace the agrarian conditioning of the yield they buy in order to give confidence without the need of an conciliator. The system is erected on Hyperledger Fabric, a private block chain network that supports growers, transporters, and consumers. Growers may keep track of their husbandry operations. Before making a purchase, guests may check the history of the product and follow its transportation by carriers all the way to delivery. IoT is used to capture husbandry settings and estimate ranch quality during planting. This demonstrates how a block chain- grounded system may be used to construct a original yield business without the use of a mediator.

**Keywords** — block chain, ranch-to- chopstick, food traceability, food force chain

## I. INTRODUCTION

Thailand is an agrarian country, with a major proportion of the people working as growers. Traditionally, interposers are demanded between growers and guests for both physical delivery and instructional transfer of goods. Currently, some growers are extremely familiar with information technology, particularly the immature population that has fled the pressures of a megacity profession and begun a new career in husbandry. These growers began selling and dealing their crops online through colorful platforms similar as Facebook and others. Still, similar networks need buyer- dealer confidence. However, similar as failure of product delivery to buyers, failure of plutocrat transfers to merchandisers, If there are issues with the deals.

Inspired by the eventuality of block chain for original communities, which was described as one of the three main use cases of block chain in husbandry in (1.) we probe a block chain result as the foundation for a system in which growers can vend their yield directly to consumers, because block chain is a technology that prevents tampering and is equipped with smart contract capability to give automated trade mechanisms. Growers may register their husbandry operations in a block chain- grounded planter-to-consumer business, and purchasers can observe the yield's route before copping it. Likewise, growers and consumers may interact on the block chain system, and if the sale violates the agreement, the system can incontinently repay guests.

This composition investigates the construction of a block chain- grounded information system to help original growers in dealing their goods to health-conscious consumers. The following is how the paper is structured. Section II begins by briefly explaining block chain and agitating affiliated work. Also, in section III, the proposed use case and process inflow that this composition is concentrating on are described. Section IV follows with the system installation and issues. Section V finishes the donation by listing some of the coming systems.

## II. RELATED WORK BLOCK CHAIN

Block chain is a system that ensures the invariability of pukka documents in the absence of a trusted mediator. Networked computers work together to maintain a growing list of blocks ( grouped data) that are cryptographically linked to former blocks. The first block chain perpetration was the system that operates the most popular cryptocurrency, bitcoin (2), which was the first time that druggies could shoot plutocrat to each other via the Internet in a peer-to- peer fashion. Since 2009, Bitcoin has been in operation and maintained by interested druggies each around the world. While bitcoin demonstrated the benefits of block chain in the environment of plutocrat transfer, block chain has latterly been delved in other settings.

Smart contracts have enabled block chain to be extended beyond bitcoin. The automated verification that an account has acceptable finances before the account proprietor may transfer plutocrat to another stoner is a critical element of bitcoin.

This idea is expanded as smart contracts, which allow for the creation of unique conditions and conduct utilising custom computer sense to automatically test conditions and perform conduct when specified circumstances are satisfied.

Smart contracts, like data recorded on the blockchain, are vindicated by the blockchain network before being saved, making them tamper- evidence and suitable to be performed on all block chain bumps. The pledge of block chain shines with its smart

contract capabilities, and it has been studied to attack trust problems in multitudinous sectors, similar as husbandry (1, 3), health (4, 5), education (6, 7).

While the most prominent block chain platforms, similar as bitcoin and ethereal (6), began as a public recording technology, block chain has grown to be private or institute platforms to service businesses where data must be kept secret from the public view. Numerous private block chain

platforms, similar as Quorum (7), Hyperledger Fabric (8), have arisen. This composition investigates the operation of a private block chain technology, specifically Hyperledger Fabric, as a foundation for food traceability.

Hyperledger Fabric is a private/ institute block chain technology designed for operation in the assiduity. A public block chain, similar as bitcoin, is a less-than- ideal option because the assiduity requires data sequestration and confidentiality for their operation, although some business data might be participated among stakeholders for more effective procedures. Hyperledger Fabric was created to overcome this problem. It makes use of holders." chain law"technology is used to allow smart contracts, which contain the system's operation sense. Hyperledger Fabric is a distributed tally programme that was created and is open source.

### Block chain and Agriculture and Food Supply Chain

Block chain has recently been expanded into the food force chain business, and block chain- grounded food traceability operations are on the increase. The fact that block chain technology's invariability aligns nicely with the food assiduity, where confidence is pivotal, might be a crucial driving element.

AgriBlockIoT, a block chain system that can incorporate IoT bias and store data for responsibility and traceability, was introduced by Caro et al. (9). Data is collected at all phases of factory and produce product, from planting to harvesting to selling and shipping, so that guests may learn about the history of the food they're copping. An trial was carried out to examine the quiescence, CPU, and network use of Ethereum with Hyperledger Sawtooth. The results indicated that Hyperledger Sawtooth is more effective and suited for IoT bias than Ethereum since it requires lower CPU and has lower quiescence.

Harvest Network, a theoretical armature for food traceability operations that connects IoT bias with the Ethereum block chain, was presented by Kim et al. (10). The study focuses on developing ways for expressing palpable means, in this case food goods, with digital commemoratives. Harvest Network uses the Ethereum network's ERC-721 standard as its token foundation, allowing digital commemoratives to be changed, traded, and covered. Harvest Network has a GS1 force chain standard to respond to standard and business regulations.

On a larger scale, Walmart used IBM's Hyperledger Fabric to cover food safety throughout its worldwide food force chain (11). Walmart's block chain trial determined which data parcels to keep on the block chain to enable item- position ( rather than batch- position) food traceability. Cases of pork chains in China and mango chains in the United States were delved. Food monitoring time has been reduced from days to a matter of seconds. This whole- chain traceability idea will enable trust in food safety, a pivotal element of the food business ecosystem, as well as fast discovery and identification of food declination, food fraud, and food impurity.

### III. PROPOSED USE CASE AND PROCESS Inflow

A simple use case may be used to show our conception for planter-to-consumer food traceability utilising block chain.



Figure 1 represents such a process, which includes the ensuing stages

#### 1. Proposed inflow of the use case.

Growers factory, cultivate, and gather the yield, consumers order the product, transporters pick up the food from growers and deliver it to consumers, who eventually enjoy the yield.

Planting Growers register Internet-of- effects (IoTs) for husbandry, which shoot data important for critical point analysis and calculating ranch quality scores. The system maintains ranch and produce data and creates retail storefronts for enrolled growers.

Planting As growers cultivate their crops, registered IoT detectors capture environmental data and routinely deposit it in block chain. Air moisture, soil moisture, pH metres, and air temperature detectors are exemplifications of detectors that cover information about developing shops every five twinkles.

Harvesting Farmers keep crop data up to date. The technology automatically changes the data on the storefront. As a result, consumers may pierce product data and choose to order yield from specific growers.

Ordering Grounded on product history data and ranch quality score, consumers decide whether or not to order.

Picked up from the planter Produce orders are entered by growers. QR canons are created in order to trace/ track the delivery of products. Carriers arrive to the granges to admit the goods and use QR canons to modernize the status of delivery.

Consumer delivery Carriers travel to delivery addresses given by guests. The QR canons are scrutinized by the guests to confirm damage of the yield.

Consumption Using a QR label fixed to the package, consumers may get the whole history of the product.

IV. SYSTEM Perpetration AND RESULTS

The system armature is depicted in Fig. 2 to support the intended use case. We've three orders of players in our operation Farmer, Carrier, and Consumer. Each kind of party can carry out their own set of deals using the web apps that have been offered. Farmer may run his or her ranch and business, Consumer can buy effects, and Carrier is in charge of carrying them. This system is comprised of three major corridor. (A) Hyperledger Fabric (8) network on longshoreman images is used by the block chain network, and the driver installs and instantiates the smart contract on the network. The network is made up of four peers (computer bumps), each representing one stakeholder and one representing the ordering service. Farmer peers are in charge of ranch and store operation. The particulars are vended to the consumer by a peer. The carrier peer is in charge of validating the vehicle.

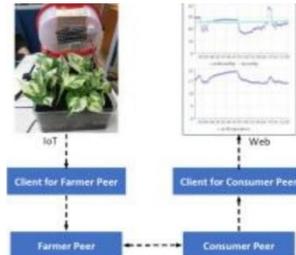


Figure 2: System Results

2. IoT data from moisture detectors are recorded on the block chain and are used to inform guests of the planting terrain. (B) APIs are theNode.js operation garçon that interacts with the stationed network via the Fabric SDK. (C) Web operations serve as stoner interfaces for three feathers of system actors. It's erected using the React frame and interacts with and submits deals to the network via theNode.js operation API.

Farm Activity and Environment Records

The capacity of original growers to record their agrarian operations and tilling settings is a pivotal notion of this system, while buyers may get the inflexible data to check before making purchases. Husbandry operations are proved on block chain by growers via online interfaces. Tilling surroundings, on the other hand, are proved using IoT bias that gather data from detectors automatically.

While this is applicable to any detector, we tested it with a detector package that detects air moisture, soil moisture, acidity or stipulation (in pH), and air temperature. Every five twinkles, data is transmitted to and stored in the block chain. As shown in Fig. 3, consumers may also recoup and see data from block chain.

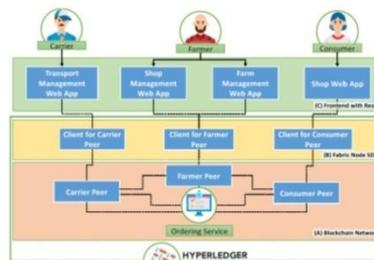


Figure 3: Proposed armature

3. Proposed armature. The system has three main layers block chain network, APIs, and frontend. Three stoner groups are supported, videlicet growers, consumers and carriers.

Figure 4 depicts a web interface via which a stoner may observe the history of the shops, from planting through harvesting, transporting, and delivering to guests. Likewise, environmental and activity data



Figure 4: depicts a web interface

The gadget calculates farm high-quality from sensor data to aid users in comprehending the overall farm soil quality with the intention to summarise data values amassed from diverse styles of IoT sensors for customers. Soil pleasant can be calculated in a ramification of techniques, and it adjustments depending at the plant. This phase demonstrates a way to determine soil first-class the use of pH readings and soil humidity. If these values are outdoor of the encouraged limits, they can create crop improvement problems [12]. Tables I and II illustrate the same old pH and soil humidity stages, respectively. according to [13], those values are based on the habitat for water spinach. whilst sensor facts is recorded each five mins, the first-class of farm at time is predicted the use of the equation 1 using sensor facts from the preceding 24 hours. due to the fact the satisfactory rating have to be between zero and 10, Equation 1 has a multiplier of five. The pleasant scale runs from zero (bad farm great at that

point) to ten (amazing farm high-quality at that point). The fine of the farm is shown on the "meals hint" net enabling clients to examine and make purchasing decisions, as defined in the following section.

#### D. Meals Hint

Customers who are involved approximately their health often want to know the history of the meals they may be thinking about purchasing and consuming. meals trace, every other critical component of the proposed device, lets in customers to achieve the records of the product from the block chain. while customers bear in mind shopping food, they may additionally view the item's planting history. As statistics from the past is out there, the first-class of farms is given. before setting a purchase, clients can also examine numerous gadgets. After setting their order, clients will receive QR codes with a view to allow them to display the things they bought. The QR codes result in net interfaces that display an outline of the switch and records of food, consisting of farm high-quality, vital records information consisting of soil acidity degrees, and the farm's prior records of drought/flood levels. figure four is an example of a monitoring of product planting records and transit moves. The product's history begins while the farmer registers production and IoT, and the statistics acquired from the IoT 6 Sensor is then up to date within the gadget. The data can be examined for farm first-class, making it simpler for customers to pick out products based totally on farm pleasant inside the timeframe. whilst a customer places an order, the farmer programs the produce and contacts a provider to have the objects brought to the purchaser. The cargo reputé may be updated: pickup, transport, and received. in the event that a purchaser forgets or loses a QR code, they will check the product history using the music code, which can be positioned inside the records of purchasing adult males. V. end AND destiny paintings this article proposes the layout and implementation of a block chain-primarily based food traceability gadget to useful resource local farmers in shooting facts and selling to healthconscious purchasers. The early results supplied go away many avenues for similarly studies open. First, we're investigating checks to assess the overall performance of this system, as there are numerous components that might be computationally luxurious. 2nd, we intend to pilot this system with actual customers and alter the device based totally on consumer input to growth consumer-friendliness and usability. 0.33, we intend to integrate a farmer rating device in the subsequent segment. ultimately, we are hoping that our findings may be utilised to improve food traceability and promote wholesome local merchandise.

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