International Journal on Science and Technology (IJSAT)
E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

Block Chain Technology in Agricultural Products Supply Chain

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ABSTRACT

Globalized delivery of manufacturing and agricultural production offer renewed attention to the health, efficiency, and validation of many vital criteria in the food and agricultural supply chain. That numbers of food safety and corruption hazards have generated an enormous need of an efficient traceability solutions which acts as an essential quality managements tools ensuring to enough product's safety within the agriculture supply chain. Block chain is the revolutionary technological method, which provides the ground breaking result for commodity traceableness in agriculture and in food supply chains. Today's agricultural supplying chains are complicated ecosystems mixing several stakeholders making it difficult to validate several significant requirements mainly towards nation of first origin, crop growth phases, quality standards compliance, and yield monitoring. This paper proposes a strategy that levitates the block chain and conducts business operations effectively across the agricultural supply chain for tracking crop prices and traceability. The proposed framework solution discards the need for trusted centralized authority, intermediaries and offers records of the transactions, improving efficient science and safety with high integrity and reliability.

KEYWORDS: Blockchain technology, Agriculture, Supply chain, Traceability, Food safety.

INTRODUCTION

To ensure product safety, handling the growth of farming products and effective management of logistics -chain in agricultural supply chain is censorious. That cover about food safety and the risk of contamination has renewed the prominence of tracing power across the supply chain Moreover, farming goods exchanged across multiple nations require accurate tracking and compliance with nation-specific regulations.Tracing of goods in the agricultural field requires to gather, communicate and maintain critical data by specifically identifying the source, multiple data exchanges in the logistic network. High-spirited nature of data in the agricultural / food supply chain where products are manufactured, processed and sent through multiple intermediaries allows tracking and tracing difficult. Contamination of products and its public health consequences highlight traceability as the required policy instrument for tracking food quality and safety. The present traceability practice in the supply chain of agriculture is mainly affected by data fragmentation and centralized controls that are susceptible to both information modification and management. In case of contamination that identifies the source and isolates the product quickly from the supply chain. Today's supply chain is becoming really complex [1]. At various stage multiple stakeholders

are present. All these Stakeholder need to collaborate with each other in various direction for efficient and effective management. To deal with food scares and accidents, the food industry becoming more customer-oriented and need quicker response time. Good traceability mechanisms help reduce the manufacture and sale of dangerous or lowquality goods,
mitigating the risk for false ads, liability and recalls. Reducing the impacts of food safety [2]. Improving food safety, and providing a means to verify food quality attribute are driving the development of traceability initiatives in agri-food system [3]. The United Nation Food and Agriculture Organization (FAO) and the International Telecommunications Union (ITU) are continuing to work together to facilitate the use of innovation Information and communication technologies (ICTs) in agriculture [4]. The importance of traceability has significantly increased with the globalization of the food industries. Therefore, the need for a reliable identification and tracking system is necessary to ensure the quality and safety of food which reaches the consumer [5]. Block chain for Supply Chain is a natural fusion of two technologies, built for mutual or common ledge transactions. A supply chain often reflects a distribution of products through industries, and is also cross-border. Food provenance is one pf FSC's most difficult issue. This issue companies are facing today. A global supply chain network with asymmetric food regulation and multiple operating procedure between various countries makes end-to-end food tracking incidental to the food industry. Distributed ledger/Block chain is very important technology that can significantly impact the supply chain management. This paper shows the possibility of block chain technology using supply chain for both perishable product and manufacturing. In food supply chain firms are rapidly adopting block chain system. Example for retailers such as Carrefour indicates that block chain can be used to provide access to rich and details information about food product, which is used to reduce the uncertainty about quality and ingredient. Food safety has been an enormous concern in China over the last few years. As conventional agri-food logistic practices can no longer satisfy consumer demands, developing a traceability framework for agri-food supply is becoming increasingly urgent.

LITERATURE SURVEY

[1] M. M. Aung and Y. S. Chang, ``Traceability in a food supply chain: Safety and quality perspectives,'' Food Control, vol. 39, pp. 172_184, May 2014.

The food industry is becoming more customer-oriented and needs faster response times to deal with food scandals and incidents. Good traceability systems help to minimize the production and distribution of unsafe or poor quality products, thereby minimizing the potential for bad publicity, liability, and recalls. The current food labelling system cannot guarantee that the food is authentic, good quality and safe. Therefore, traceability is applied as a tool to assist in the assurance of food safety and quality as well as to achieve consumer confidence. This paper presents comprehensive information about traceability with regards to safety and quality in the food supply chain.

[2] T. Bosona and G. Gebresenbet, ``Food traceability as an integral part of logistics management in food and agricultural supply chain,'' Food Control, vol. 33, no. 2, pp. 32_48, 2013.

This review has pointed out that the issue of developing effective and full chain FTS is quite complex in nature as it requires a deeper understanding of real processes from different perspectives such as economic, legal, technological, and social issues. Therefore, future researches (recommended here) on traceability should focus on: integration of traceability activities with food logistics activities; technological aspects of FTSs; the linkage between traceability system and food production units; standardization of data capturing and information exchange; awareness creation strategies; continuity of information flow and

effective communication of traceability information to consumers and other stakeholders; the linkage between different drivers of FTS; improvement strategies of FTS; and development of performance evaluation frameworks for FTSs.

[3] J. Hobbs, ``Liability and traceability in agri-food supply chains,'' in Quan- tifying the Agri-Food Supply Chain. Springer, 2006, pp. 87_102.

Improving food safety, reducing the impacts of food safety problems, and providing a means to verify food quality attributes are driving the development of traceability initiatives in agri-food systems. Numerous and varied examples exist, from regulatory traceability initiatives, to industry-wide livestock traceability programmers, to individual supply-chain systems that combine traceability with quality verification. This paper explores the economic functions of traceability, examining the extent to which traceability can bolster liability incentives for firms to practice due diligence. The extent to which consumers value traceability per se, versus verifiable quality assurances delivered through traceability, is evaluated empirically using survey and experimental auction data.

[4] D. Mao, Z. Hao, F. Wang, and H. Li, ``Novel automatic food trading system using consortium blockchain,'' Arabian J. Sci. Eng., vol. 44, no. 4, pp. 3439_3455, Apr. 2018.

It uses consortium blockchain technology to set permission and authentication for different roles in food transaction, which meet the challenge of the privacy protection of multi-stakeholders. The algorithm of optimized transaction combination is designed for the purpose of helping users find suitable transaction objects. It can choose the optimized trading portfolio for buyers. The online double auction mechanism is used to eliminate competition. And the improved PBFT (iPBFT) is used to enhance efficiency of system. Moreover, a smart-contract life- cycle management method is introduced, and security analysis shows that FTSCON improves transaction security and privacy protection. Experiment results based on a series of data indicate that the proposed algorithm can achieve profit improvement of merchants.

[5] **L. U. Opara and F. Mazaud, ``Food traceability from _eld to plate,'' Outlook Agricult., vol. 30, no. 2, pp. 239_247, 2001.**

This paper provides a global overview of ‘traceability’ as a quality index in food trade, and discusses some of the drivers in both developed and developing countries. Policy changes are necessary specifically to incorporate traceability into existing food safety regulations and trade agreements. This will require further investments in information technology for data capture, storage and retrieval. Small-scale farmers in many developing regions moving towards market orientation face considerable technical and financial challenges in implementing appropriate food traceability systems in order to meet marketing compliance requirements.

[6] Li, Q., Wang, M., Gu, W.: Computer Vision Based System for Apple Surface Defect Detection. Computers and Electronics in Agriculture 36, page 215-223.

A novel automated apple surface defect sorting experimental system based on computer image technology has been developed. The hardware system has the advantage of being able to inspect simultaneously four sides of each apple on the sorting line. The methods, including image background removal, defects segmentation and identification for stem-end and calyx areas, were developed. The results show that the experimental hardware system is practical and feasible, and that the proposed algorithm..

SYSTEM ANALYSIS

Existing System

There is no computerized system in place to trace the cost of agriculture. Agricultural products cannot be

obtained by the farmer.72 percent of the population in India is dependent on the farming industry. Farmers get enormous quantities of crop manufacturing, but they have not got the correct price because they can survive the present circumstances. So they are suicide and nothing is done by the government. So we are attempting to fix this issue in the suggested scheme by tracing the cost of the agricultural product from farmer to client.

Disadvantages

1. **High Complexity**: Refers to intricate systems or processes that are difficult to understand, manage, or implement efficiently, leading to increased costs, potential errors, and reduced user-friendliness.
2. **Low Computation:** Signifies limited computational power or processing capability, restricting the system's ability to handle complex tasks, resulting in slower performance and reduced functionality.

Proposed System

In proposed system we are using a Block chain helps which helps in maintaining the integrity and transparency of the whole process right from inception of crop details. Blockchain helps in managing and tracing the crop information transparent distribution.

Advantages

- Customer can get appropriate price of the product.
- Farmer can get the FRP price for his product or crop.

Work Flow of Proposed system

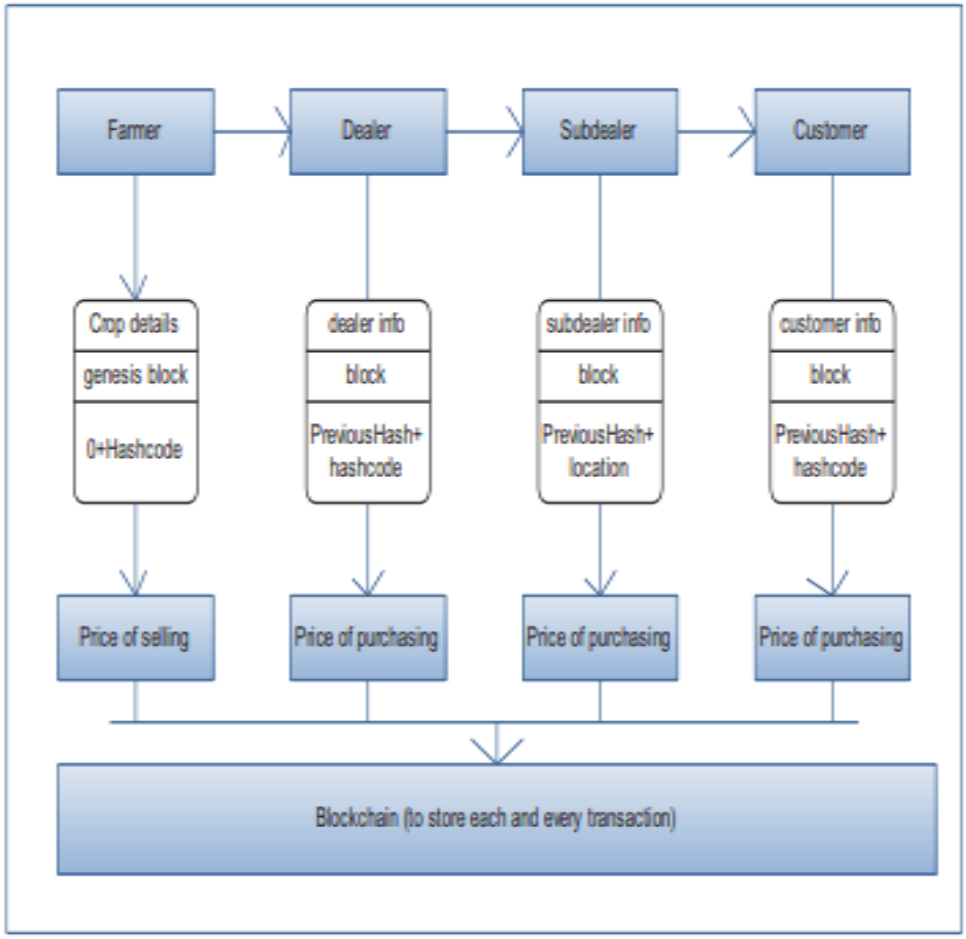

Fig 1. .work flow of proposed system

SYSTEM DESIGN

Architecture

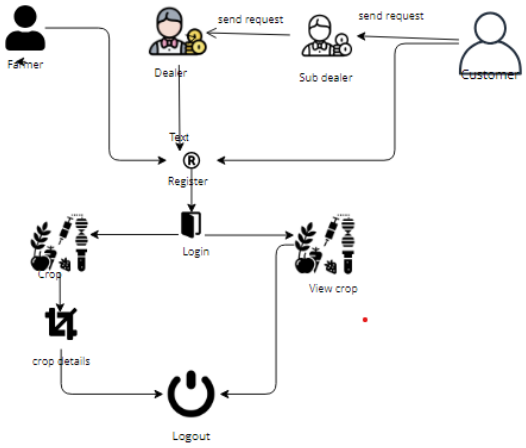

Fig.2. Architecture

Input Design

In an information system, input is the raw data that is processed to produce output. During the input design, the developers must consider the input devices such as PC, MICR, OMR, etc.

Therefore, the quality of system input determines the quality of system output. Well-designed input forms and screens have following properties −

- It should serve specific purpose effectively such as storing, recording, and retrieving the information. It ensures proper completion with accuracy.
- It should be easy to fill and straightforward.
- It should focus on user's attention, consistency, and simplicity.

Output Design

The design of output is the most important task of any system. During output design, developers identify the type of outputs needed, and consider the necessary output controls and prototype report layouts.

IMPLEMENTATION

Modules:

In this project there are four modules

1. Farmer
2. Dealer
3. Sub-dealer
4. Customer

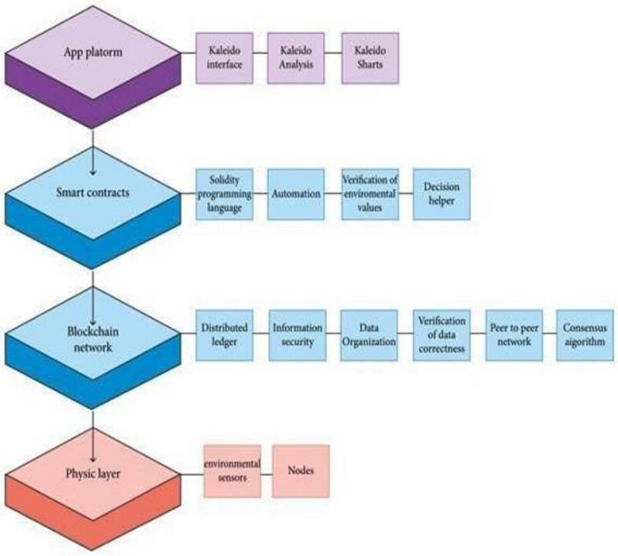

Fig.3.Implementation

Farmer: Farmer is first block of the block chain which contain the farmer details like name, address, mobile no, crop name, crop selling price (FRP). All details are added into smart contract and smart contract generate the hash code using sha256 algorithm. Then block chain mine the block and added to block chain network.

Dealer: Dealer contain the login registration which can hold the crop price details which are fix by the government and particular organization. the block chain is immutable so no one can change the crop price and farmer's details So dealer is contain his own data and previous hash code of the farmer.

Sub-Dealer: Sub-dealer can buy product from the dealer which is fix price and the price is determine by the government. And sub dealer cannot increase the price of the product. Because block chain contains immutable so each and every time data change block can generate different hash code.

Customer: Customer is last entity of the block chain which are purchase the product. He does not know the exact price of the product so we can give authenticate permission to check the price of the product from farmer to customer So customer can get the all chain details and price details.

RESULTS

App Platform

HOME PAGE

Fig.4.App Home Page

It represents the home page of the app platform that has been designed by using kaleido interface and analysis.It shows various modules like dealer sub dealer and customer page to implement.

SMART CONTRACTS
FARMER
FARMERS REGISTRATION PAGE

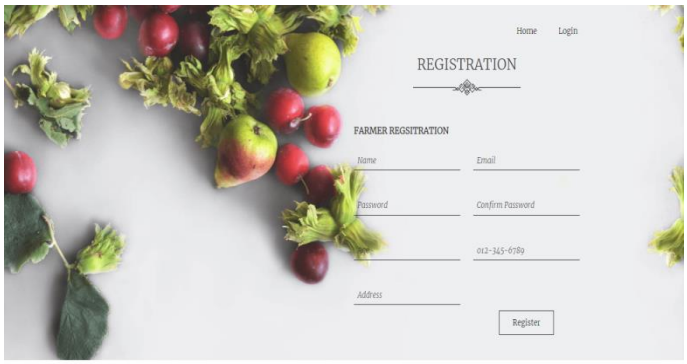

Fig.5.Farmers Registration Page

The above figure shows that the farmers registration page that contains farmers details and crop details has to be sent to the dealer.

FARMERS LOGIN PAGE

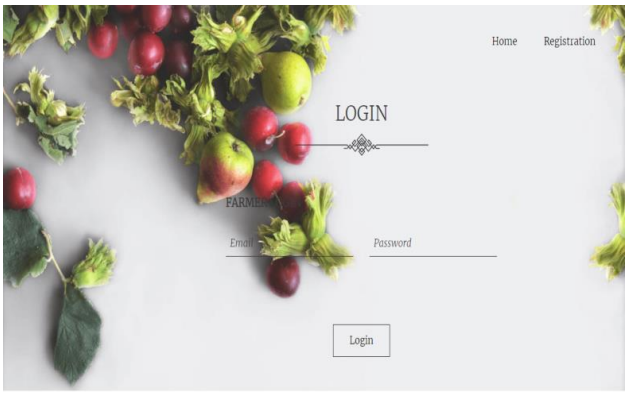

Fig.6.Farmers Login Page

After the registration details,the login credentials have been saved and in the login page the details been entered.

FARMERS HOME PAGE

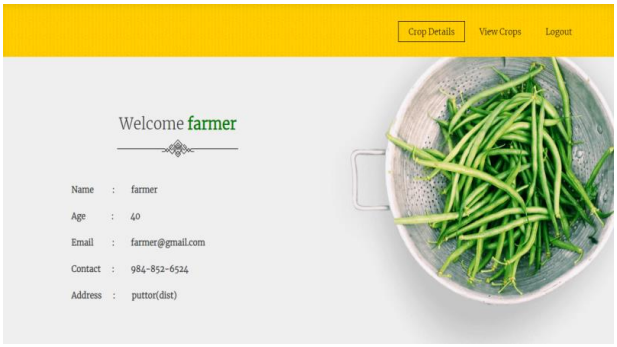

Fig.7.Farmers Home Page

The above figure represents the farmers home page that shows the details about the farmer by implementing solidity programming language.

CROP DETAILS UPLOAD PAGE

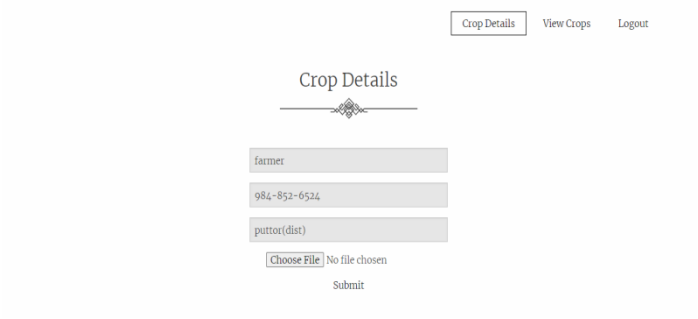

Fig.8.Crop Details Upload Page

Crop details and information has been viewed in the figure 8.This details has submitted by the farmer during the yield to send to the buyer or customer.

CROPS VIEW PAGE

Fig.9.Crops view page

The crop details has been viewed to the farmer to check as in the above figure.

DEALER

DEALER REGISTRATION PAGE

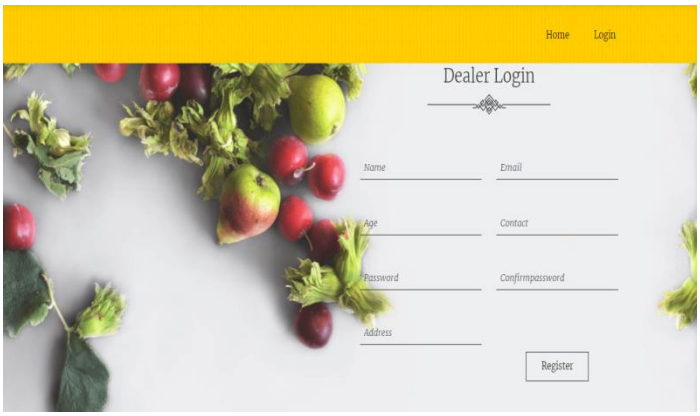

Fig.10.Dealer Registration Page

After the farmer providing the crop information the dealer can login into their user as follows.

DEALER LOGIN PAGE

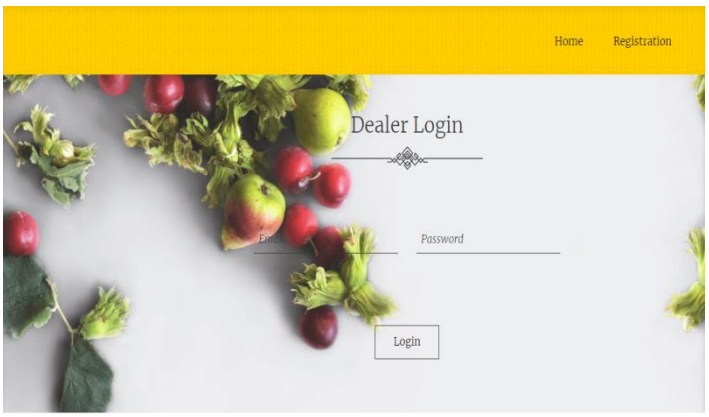

Fig.11.Dealer login page

Login page of the viewer that has contained the username and password by registration process.

DEALER HOME PAGE

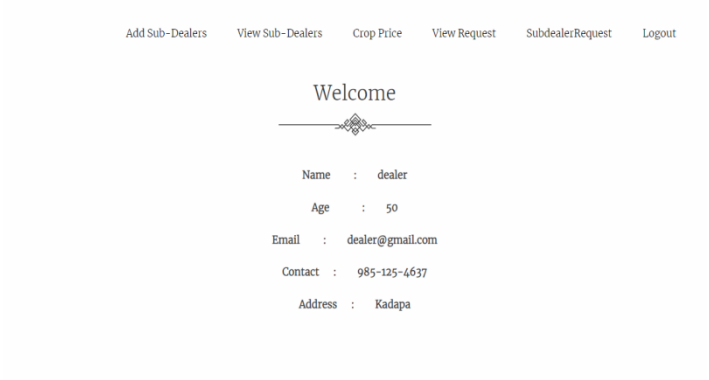

Fig.12.Dealer home page

Login credentials of the dealer has been viewed.

SUB DEALER
ADD SUB-DEALER PAGE

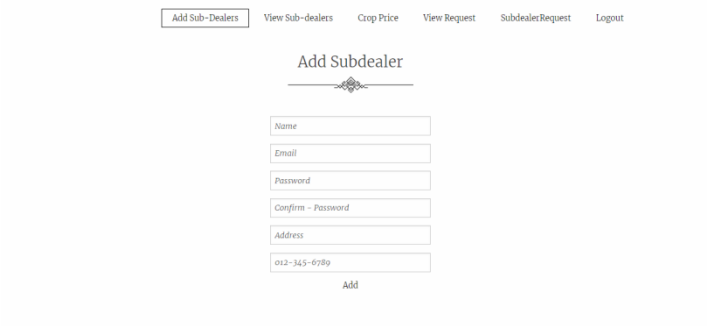

Fig.13.Sub-dealer page

The dealer has been involved and resolve the problems and can insist the dealer.

VIEW SUB DEALER PAGE

Fig.14.View sub dealer page

The sub dealer can see the information about their details to send to the dealer to accept the request.

VIEW CROP PRICE

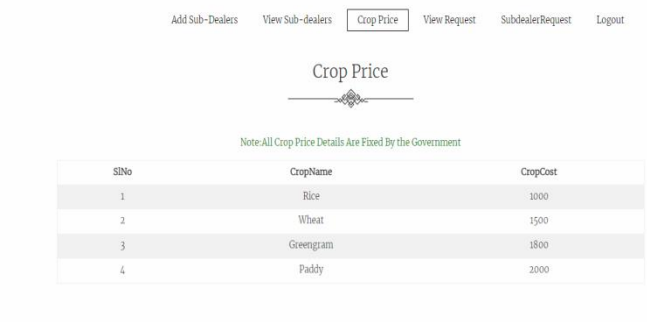

Fig.15.View Crop price

The crop price can has been viewed by the subdealer to intimate the farmer easily.

VIEW REQUEST

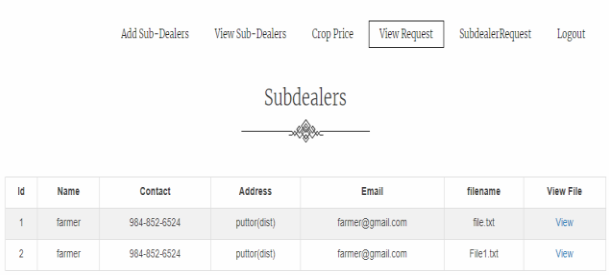

Fig.16.View Request

The request sent by the farmers including crop names and quantity has seen and can accept the request.This details helps them to ensure the crop price and crop availability.

SUB DEALER REQUEST

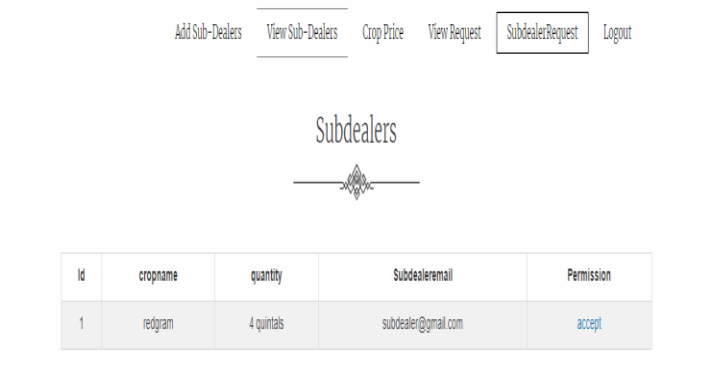

Fig.17.Sub dealer request

The request has been sent to the sub dealer who has to accept the crops.

SUB DEALER LOGIN

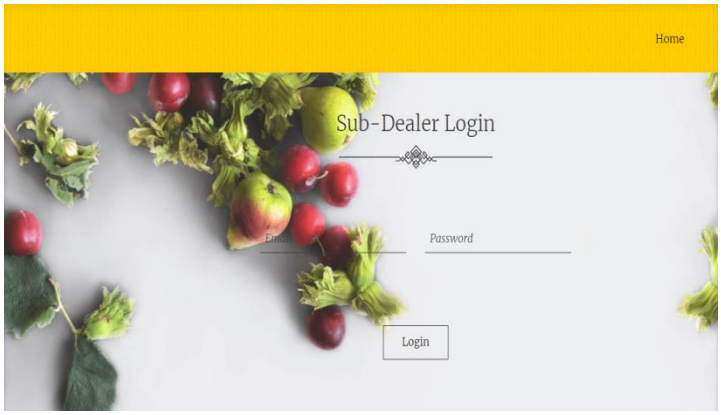

Fig.18.Sub dealer login

The sub dealer login to their account to view the request by the dealer.

SUB DEALER HOME PAGE

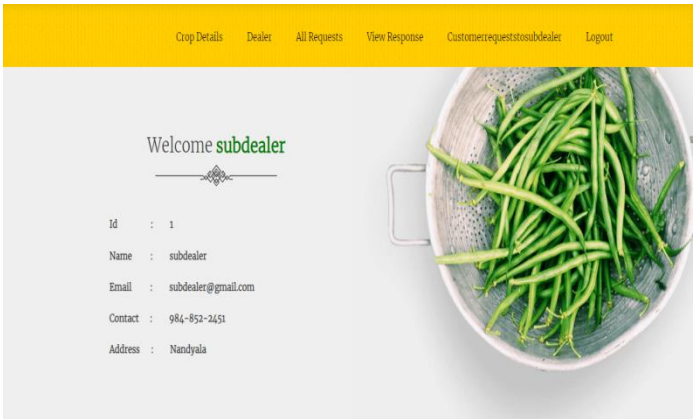

Fig.19.Sub dealer home page

These are the details of the sub dealer or about their login credentials.

CROP DETAILS

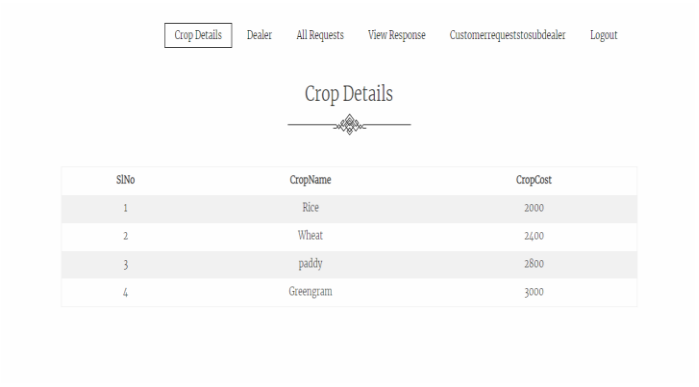

Fig.20.crop details

The sub dealer see the crop details by the farmer and over check the quantity and the crops needed.

SEND REQUEST TO DEALER

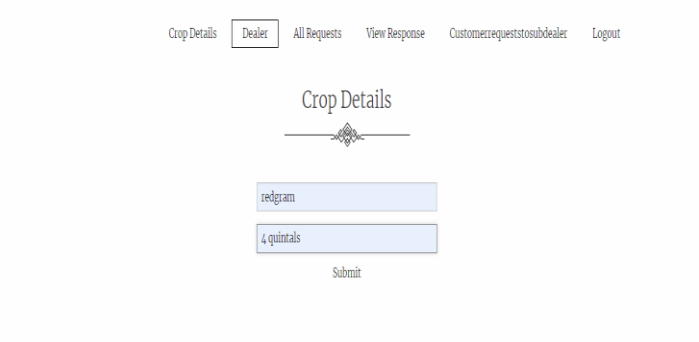

Fig.21.Send request to dealer

The sub dealer send request to the dealer the required amount of quantity or the crops according to the availability.

CUSTOMER

CUSTOMER REGISTRATION PAGE

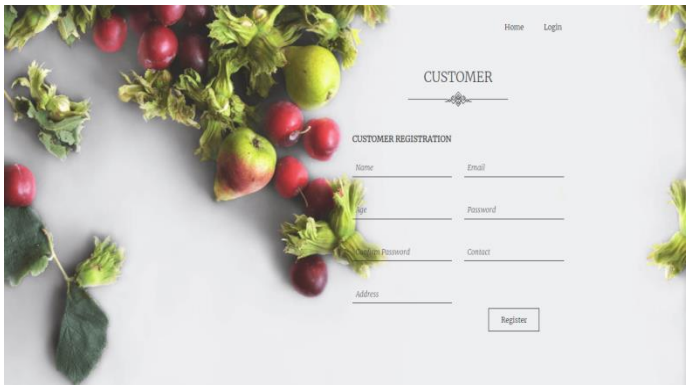

Fig.22.Customer registration page

Now the customer who required the crops should register in this to buy the products.

CUSTOMER LOGIN PAGE

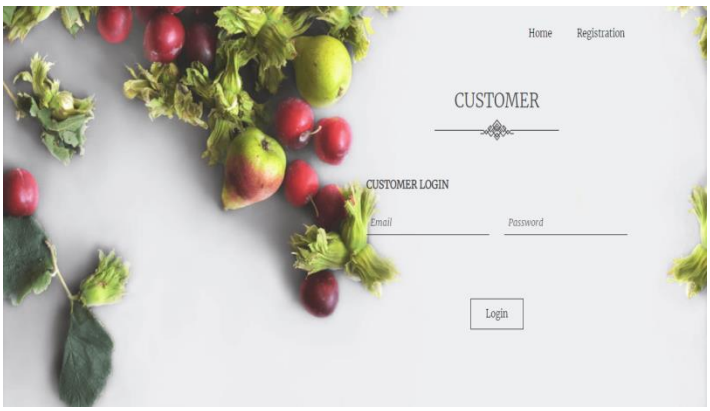

Fig.23.customer login page

CUSTOMER HOME PAGE

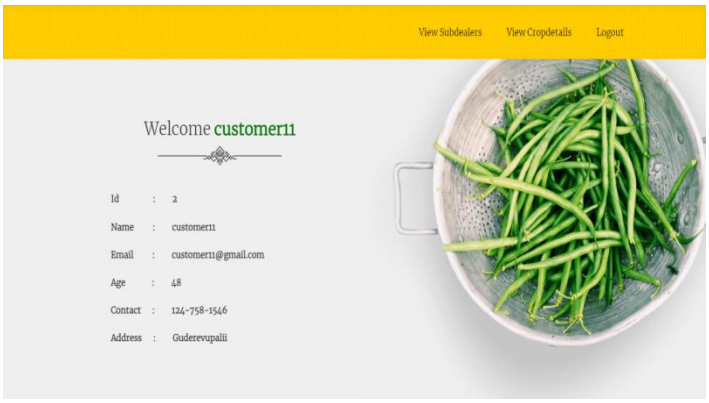

Fig.24.Customer home page

The details of the customer has been provided as in the above figure who are accessed to buy the products from the farmers.

VIEW SUB DEALERS

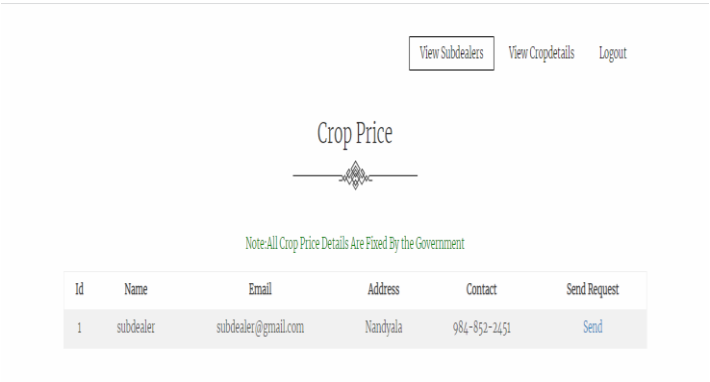

Fig.25.view sub dealers

The customers can see the sub dealer request or the information given by the sub dealers to the customers about the crop price and the availability of the crops.

VIEW CROP DETAILS

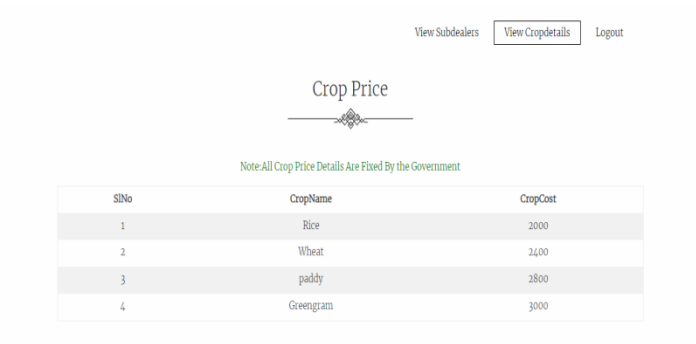

Fig.26.View crop details

Then the crop details has been shown to the sub dealers that has accepted by the customers and these can be sold by the sub dealer.

CONCLUSION

In conclusion, the globalized food and agricultural supply chain demands increased attention to safety and traceability due to numerous food safety and corruption challenges. Blockchain technology presents a groundbreaking solution, enhancing commodity traceability in agriculture and food supply chains. The proposed strategy, which operates without centralized authorities or intermediaries, ensures efficient operations and data integrity. Transactions are securely registered and stored on an immutable blockchain ledger, offering a very high degree of traceability and transparency. This approach promises a stable, reliable, and efficient ecosystem, addressing critical requirements in modern agricultural supply chains and ultimately promoting safety and confidence within the industry.

FUTURE ENHANCEMENT

Future enhancements should encompass broader adoption of blockchain in agriculture, fostering industry standards for interoperability. Integration with IoT devices could offer real-time data on crop conditions. Smart contracts for automated transactions and compliance. AI and data analytics can enable predictive quality control and sustainable farming. Mobile apps for all stakeholders could promote user-friendly access to supply chain information. Efforts to ensure scalability, regulatory compliance, and continuous monitoring must continue, and further research should explore blockchain tokenization for financing and incentivization.

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