International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 05, May-2021

Agroblock-Blockchain Based Solution for Agriculture

Ms. Vanditha Sadanand Rai, Ms. Sheetal Nagnath Ingale, Prof. Sujata Kullur
Usha Mittal Institute of Technology , SNDT University

***Abstract*—Blockchain technology is gaining interest in a num- ber of agricultural applications. These technologies may meet a range of needs in the agricultural product ecosystem, such as en- hancing food protection and supply chain reliability, provenance traceability, smart contract trade performance, and transaction efficiency. As a result of the numerous untrustworthy parties involved, such as small-scale producers, food processors, logistic firms, dealers, and retailers, achieving an optimum trade-off between productivity and credibility of agricultural management systems as needed in contexts becomes critical. In this project, we will establish a blockchain-based framework for the agricultural sector. From the farmer to the producer, an agricultural supply chain follows a farm commodity. Since the existing supply chain is so intertwined, blockchain can be used to restore customer and supplier confidence. Blockchain will totally erase layers in the supply chain, allowing producers to partner directly with merchants to raise revenue for both parties for specific crops in specific regions.We will also explore the key obstacles that many future agricultural systems face, as well as the attempts and possible solutions that have been made to address these issues. We should also add a lot of items that will benefit both farmers and consumers.**

***Index Terms*—Blockchain,food supply chain,smart contracts,traceability,transparency**

I. INTRODUCTION

INDIA:is a developing country with a large rural population whose primary occupation is agriculture. Agriculture, along with its allied industries, is India's most important source of income. Agriculture continues to be the primary source of income for 70percent of rural households, with 86 percent of farmers being small and marginal.In India, agriculture is no longer a lucrative business. Farmers are clearly losing money
on their crops.

Food product integrity during the supply chain is always a major concern for society. Many emerging technologies have been implemented in the supply chain as a result of the rapid growth of the internet. However, the centralised nature of these systems creates trust issues such as fraud, tampering, and falsifying data. The solution to the problems that arise in the supply chain system is blockchain technology, which is decentralised, not governed by any central authority, and distributed. Blockchain is a distributed ledger technology that allows all participants to record transactions in a shared data log stored on a network of computers, rather than a physical ledger or a single database.One of the most logical applications of blockchain is in agriculture which is plagued with several challenges faced by farmers as well as consumers.

II. PROBLEM STATEMENT

There are several flaws in India's agricultural system. One example is the crop supply chain, in which the middleman charges a high fee, resulting in farmers paying a low price for their products.We don't really know where the crop produce comes from in the current scheme, nor do we know whether the farmers are being paid the correct sum for what they've planted.There is no transparency and traceability of products for farmers as well as consumers in the current supply chain, which makes the whole process unreliable.So to make this process reliable and trustworthy,blockchain can be a optimal solution.

Farmers usually have to confront unpredictable weather conditions while growing different types of crops.Therefore, predicting and monitoring weather conditions are essential to the crop survival.Moreover, the lack of transparency in the current food chain ecosystems can result in unsure and high surge pricing. Consumers don't have any idea when did the crops suffer bad weather conditions and what has led to the sudden increase in costs.Farmers and other stakeholders will be able to grasp the price differences in the food distribution industry thanks to blockchain's ability to provide traceability and transparency. Farmers can easily get crop insurance claims through smart contracts and the current government scheme because approved parties can trace weather conditions from the blockchain ledger.Many Problems can be solved via this technology but we are particularly focusing on these two problems.

III. RELATED WORK

As part of the emerging e-agriculture system, blockchain is shaping the entire sector to solve food problems in the twenty- first century. It ensures data privacy and integrity by combining smart farming and precision agriculture techniques to improve farm productivity.Overall, all stakeholders in the agricultural sector will benefit greatly from it. They've compiled a detailed analysis of existing blockchain-based agricultural technologies and inventions in order to promote blockchain technolo- gies, particularly their various applications in the agricultural ecosystem.This article has covered a number of aspects of blockchain technology, including its data storage ecosystem and a number of popular application platforms. It looked into the agricultural sector's problematic blockchain applications in depth. Then it has taken into account a number of key chal- lenges in the current use of blockchain-related technologies in agricultural applications and provided solutions to them.The challenges include scalability, integration with existing

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 05, May-2021

legacy systems, and security and privacy. Simply put, our proposed solutions entail a complete system re-architecture. The ongo- ing COVID-19 global food crisis has also served as a model for potential future blockchain innovations and applications in this field. *(Blockchain technology in current agricultural systems: from techniques to applications;Volume 4 2016 IEEE paper)*

Here,the proposed project explains a mechanism, in which insurers can deploy weather-based insurance programs for farmers who face extreme weather, such as droughts and floods and possible damages. The method for determining crop trigger and compensation values varies depending on socioeconomics, geography, and weather conditions. Many IWCs in Southeast Asia are currently state-owned businesses. Due to government subsidy, water supply performance and successful irrigation are not adequately evaluated. Using a blockchain-based smart contract to insure crops is one way to monitor progress of the efficiency of water supply and demand in regions that are far away from waterways. The research team anticipates difficulties in defining the design of the entire smart contract, as well as incorporating OAAS and API data sources (satellites, drones, and sensors). If only one source of data is used to close a claim in a smart contract, it may lead to disagreements. In order to triangulate data to gain more credibility with agricultural producers, from two or more sources in the future, it would be necessary to communicate with two or more data sources. *(NEO Smart Contract for Drought-Based Insurance ,2019 IEEE Canadian Conference of Electrical and Computer Engineering (CCECE))*

A solution and generic framework leveraging Ethereum blockchain and smart contracts to trace, track, and perform business transactions removing intermediaries and central point of processing for soybean traceability across agricultural supply chain. Presented details and aspects related to the sys- tem architecture, design, entity-relation diagram, interactions, sequence diagrams, and implementation algorithms. They have showed how their solution can be applied for tracing and tracking soybean supply chain. However, the presented aspects and details are generic enough and can be applied to provide trusted and decentralized traceability to any crop or produce in the agricultural supply chain *(Blockchain-Based Soybean Traceability in Agricultural Supply Chain,Volume 7)*

IV. Blockchain and it's use in agriculture

Blockchain technology is a network of peer-to-peer nodes that stores public transactional records, also known as blocks, in several databases. A 'digital ledger' is a common term for this type of storage. The owner's digital signature is required for every transaction in this ledger, which authenticates the transaction and safeguards it from tampering. As a result, the data in the digital ledger is extremely stable. In simpler terms, the digital ledger is similar to a Google spreadsheet that is exchanged across several machines in a network and stores transactional records based on actual transactions. Anyone can see the data, but they can't change it.The way Blockchain technology confirms and authorises transactions is one of its most important features. For example, if two people want to make a transaction using their private and public keys, the first person will connect the transaction details to the second person's public key. This entire set of data is compiled into a block. A digital signature, a timestamp, and other significant, related data are all included in the block. The identities of the persons involved in the transaction are not included in the block. This block is then sent through the network's nodes, and the transaction is completed successfully when the correct person uses his private key to align it with the block. Agriculture could be fully transformed by blockchain- based DAPPs. More specifically, it has an increasing array of problems that we must address immediately. The agriculture sector will benefit from blockchain technology in a variety of ways.

Uses Cases of Blockchain in Agriculture: ***1: Crop and Food Production*** Although improving profitability in un- favourable environmental conditions, the agriculture sector faces numerous challenges, including: -meet the growing pop- ulation's needs by growing more food with limited resources - reduce environmental impact -allow supply chain transparency
-ensure farmers receive a fair wage -manage weather condi- tions

2: Food Supply Chain It's vital to keep an eye on the food supply chain in order to figure out where the food comes from. It ensures that the food distributed is healthy to eat. However, due to the current state of the food supply chain, it is difficult for food producers and retailers to check the origin of their products. The blockchain food supply chain will reduce food risk by taking the following steps:

Step 1: Farmers storing data Step 2: Distribution of grown crops to the food processing companies Step 3: Supply of Pro- cessed Food to Wholesalers and Retailers Step 4: Consumers can backtrace the supply chain

3: Controlling Weather Crisis Farmers are frequently con- fronted with unexpectedly changing weather conditions when cultivating crops. As a result, crop survival is reliant on the ability to predict and track weather patterns. Many of the crops grown are susceptible to flooding from heavy rains. Furthermore, the lack of clarity in today's food chain ecosys- tems will result in high surge pricing that is unpredictable. Consumers have no idea if bad weather harmed crops or contributed to higher prices. Thanks to blockchain's potential to provide traceability and transparency, farmers and other stakeholders will be able to appreciate price differences in the food distribution industry,because approved parties can track weather patterns from the blockchain ledger, farmers can easily collect crop insurance claims from smart contracts.

4: Managing Agricultural Finance Smallholders and structured financial inclusion face many difficulties, including a lack of clarity, credit history, and contract

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 05, May-2021

compliance issues. Lack of access to finance may have a negative impact on agricultural value chain production, leading to: -producers not maximizing their yields - buyers facing struggles to ensure an efficient supply of commodities. It results in buyers' difficulty to pay farmers on delivery, forcing poor smallholders to sell crops at the lower rates. =Blockchain brings fairness and transparency in the process of agricultural finance . The four benefits of implementing blockchain technology in agriculture are:

-Improved quality control and food safety
-Increased traceability in the supply chain
-Increased Efficiency for farmers
-Fairer payments for farmers

V. Design and Implementation

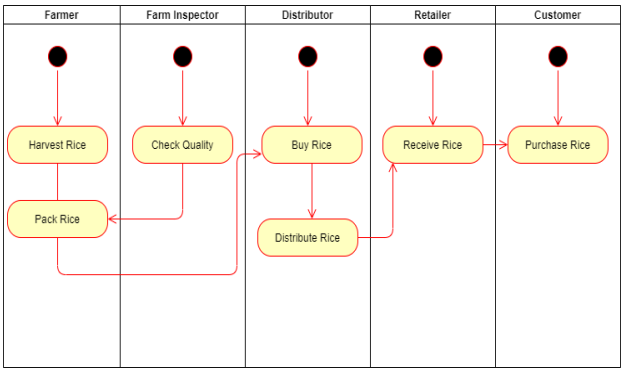


Fig. 1. Activity Diagram of the Supply Chain application

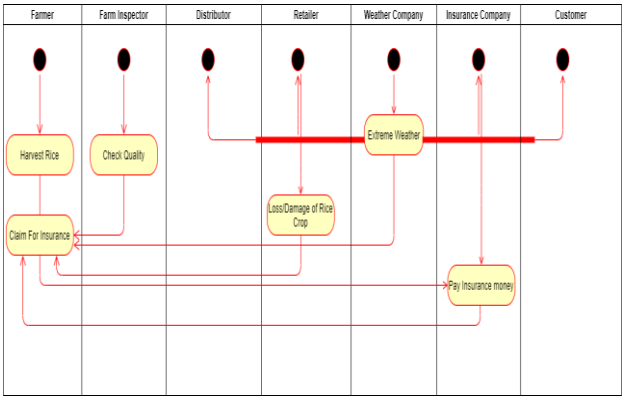


Fig. 2. Activity Diagram of Crop Insurance application

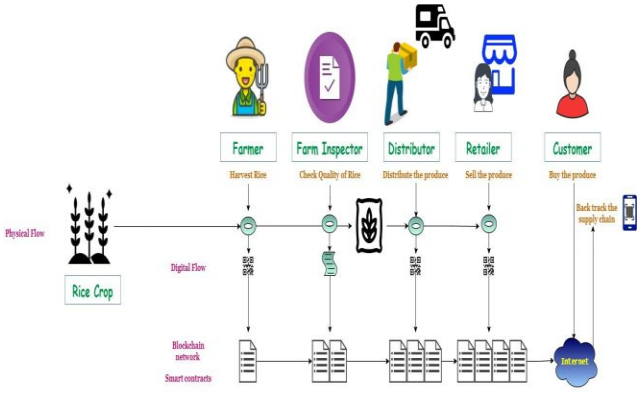


Fig. 3. Flowchart of the supply chain application

This flowchart shows Rice Crop Supply Chain management and process tracking on Ethereum Blockchain. By this appli- cation we would be able to provide transaparency of every process of rice production right from harvest to rice delivered to the customer.

The supply chain contains a minimum of 5 different actors
:

Farmer : Plucking, hulling, polishing, grading, and sorting activities are conducted by farmers, who maintain of the crop variety, temperature used, and humidity maintained across the process.

Farm-Inspector : Farm inspectors are in power of surveying rice farms and sharing data such as rice family, seed type, and fertilisers used in rice production.

Distributor : Distributors are firms that export rice grain everywhere . Quantity, destination address, ship name, ship number, estimated date and time, and Distributor id all are added by the distributor.

Retailer :Retailers receive rice from rice suppliers and update volumes, ship names, ship numbers, transporter in- formation, warehouse names, warehouse addresses, and the Retailer's address.

Consumer: The consumer can buy rice packet and track authenticity.

Every Actor actor has a smart contract and can see other smart contracts of other actors which builds trust and makes things traceable

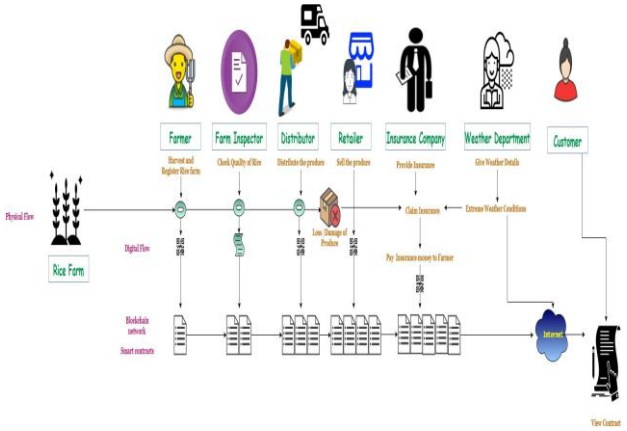


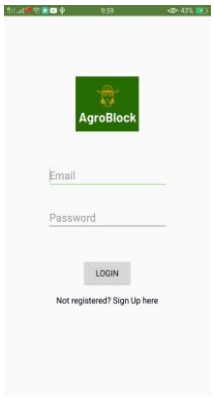
Fig. 4. Flowchart of the Crop Insurance application

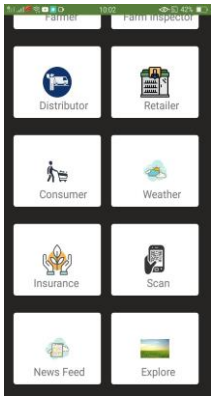
The stakeholders involved in the Crop Insurance Solution are as mentioned below -

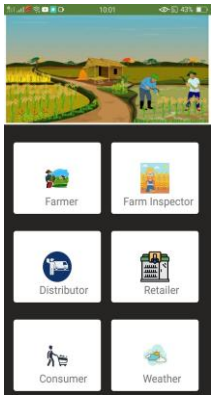
1]Farmer - Obtains Insurance Coverage
2]Weather Data Station - Updates Weather Data 3]Insurance Company- Gives out Insurance
4] Consumer -View the Insurance Contract and offer support to farmer
5] Distributor/Retailer -View the Insurance contract and re- port if there's any loss/damage in the goods while distributon or receiving goods
7]Farm Inspector - Interpret the contract and, while inspect- ing it, report if there are a loss to the farmer so that he can file a claim

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 05, May-2021

Implementation of Android Application







VI. Software Requirements

1]Truffle Suite:

Truffle Suite is a development environment based on Ethereum Blockchain, used to develop DApps (Distributed Applications). Truffle is a one-stop solution for building DApps.

Truffle Suite has three parts:

Truffle : It is a Development Environment, Testing Frame-work,Asset pipeline for Ethereum Blokchains

Ganache : Ganache is a personal Ethereum Blockchain used to test smart contracts

Drizzle : Drizzle is a collection of libraries

2]MetaMask

MetaMask is a simple browser plugin (for Google Chrome, Firefox, and Brave browsers) that allows you to make Ethereum transactions using a graphical user interface. It allows you to run Ethereum DApps in your browser without having to instal an Ethereum node. MetaMask is an open- source programme that has features:

3]Solidity

Solidity is an object-oriented, high-level language for imple- menting smart contracts. Smart contracts are programs which govern the behaviour of accounts within the Ethereum state. Solidity was influenced by C++, Python and JavaScript and is designed to target the Ethereum Virtual Machine (EVM). With Solidity you can create contracts for uses such as voting, crowdfunding, blind auctions, and multi-signature wallets.

4]Node.js

Node.js is an open-source, cross-platform, back-end JavaScript runtime environment that executes JavaScript code outside a web browser

5] Android Studio

Android Studio is the official Integrated Development En- vironment (IDE) for Android app development.Java language would be used to make android app here.

6] Java

Java is a class-based, object-oriented programming language that is designed to have as few implementation dependencies as possible.

7] Sublime Text OR Visual Studio,Apache Server ,QR code for traceability in supply chain and IPFS are also some requirements

8] Web3j

A highly modular, reactive, type safe Java and Android library for working with Smart Contracts and integrating with clients (nodes) on the Ethereum network.This allows you to work with the Ethereum blockchain, without the additional overhead of having to write your own integration code for the platform.

VII. Future Scope

In this paper we have decided to take Rice as our main entity to focus on.It's supply chain will be monitored,tracked and traced.Similarly we can do this with other crops like wheat,maize,barley,etc and fruits as well as vegetables.

Talking about which region is to be considered, for now are concentrating on Konkan region of Maharashtra but as a whole India could be done.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 05, May-2021

Meanwhile some other additions to this application could be made for effective means of agriculture for farmers of India such as Land Registry,Equipment handling and giving it out for rent for a particular time period or buying it forever,using IOT sensors for soil health monitoring and health of crops via real time imaging.

So meanwhile these things can be included if they are feasible to be implemented.

VIII. APPENDIX

IPFS	Inter Planetary File System
NEO	Non Equity Option
IWC	International Whaling Commission
SEA	South East Asia
OAAS	Orchestration As A Service
DAPP	Decentralized Application
API	Application Programming Interface
COVID-19	Corona Virus Disease - 2019

REFERENCES

[1] Accenture -Tracing The Supply Chain,2018
[2] Blockchain technology in current agricultural systems: from techniques to applications;Volume 4 2016 IEEE
[3] Blockchain in Agriculture: A Systematic Literature Review-Springer,CITI,2018
[4] http://docs.web3j.io/latest/smartcontracts/interacting with smart contract/
[5] https://doi.org/10.3390/environments4030050
[6] https://ieeexplore.ieee.org/document/8373021
[7] https://ieeexplore.ieee.org/document/8718621
[8] https://ieeexplore.ieee.org/document/9159588
[9] NEO Smart Contract for Drought-Based Insurance ,2019 IEEE Canadian Conference of Electrical and Computer Engineering (CCECE)