# IMPROVING THE SUPPLY CHAIN MANAGEMENT IN INDIAN AGRICULTURE SECURED WITH BLOCKCHAIN

Submitted in partial fullfillment of therequirements for the award of

Bachelor of Engineering degree in Computer Science and Engineering

by

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**SCHOOL OF COMPUTING**

# SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY**
**(DEEMED TO BE UNIVERSITY)**
**Accredited with Grade "A" by NAAC| 12B Status by UGC | Approved by AICTE**
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**APRIL - 2023**

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**<u>BONAFIDE CERTIFICATE</u>**

This is to certify that this Project Report is the bonafide work of **MANNE MOHITH VAMSI (Reg.No-39110600) and MAKINENI MADHAN (Reg.No-39110587)** who carried out the Project Phase-2 entitled **"IMPROVING THE SUPPLY CHAIN MANAGEMENT IN INDIAN AGRICULTURE SECURED WITH BLOCKCHAIN"** under my supervision from Jan 2023 to April 2023.

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# DECLARATION

I, **MAKINENI MADHAN (39110587),** here by declare that the Project Phase-2 report entitled "**IMPROVING THE SUPPLY CHAIN MANAGEMENT IN INIDAN AGRICULTURE SECURED WITH BLOCHCHAIN"** done by me under the guidance of **Dr.M.SELVI,M.Tech.,Ph.D.,** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in **Computer Science and Engineering**.

**DATE:20-04-2023**

**PLACE: Chennai** **MAKINENI MADHAN**

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# ABSTRACT

In today's agriculture and the food supply chain in general, there appears a history of quick adoption and assimilation of new technologies, especially cost reduction technologies.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. Agriculture basically looks like a non profitable organization but with suitable methods and new technologies we will make it change like a highly profitable sector. Agriculture was identified as one of the great promises of e-commerce due to the high level of fragmentation present in the supply chain, large volumes traded, and homogeneous products only reinforced the expectations. Internet technology has provided the possibility for cost reduction and demand enhancement alongthe food supply chain through the use of e-commerce.This paper encapsulates the status of Information Technology and Agriculture in India, e-business platform for Indian Agriculture market and challenges as well as strategies in adoption of e-commerce in agribusiness sector in India.The present study starts with a pitching to e-commerce and agriculture along with general framework for e-commerce adoption followed by different business models supporting e-commerce adoption. But e-commerce is still relatively primitive, but today more and more companies want to publish on theInternet itself, as this is essential to remain agriculture as a goodsitive.Blockchain based supply management system is a software package similar to an e-commerce site which is primarily developed in Python, HTML as the Front End and MY SQL as the Backend for the Agriculture Management

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# CHAPTER 1

# INTRODUCTION

India is one of the agriculture-based country in the world. The history of agriculture in India starts from Indus Valley Civilization. But in such a historical country, many farmers are starving for their income while foreign countries are earning lakhs from the same. One of the reasons for the above cause is the very poor supply chain management. It is a well-known fact that most of the farming items decay very fast if not maintained properly. In the existing supply chain management, though the government provides storage houses for the farmers, the farmers could not trackthe status of their goods. Also, there is no proper system for tracking the status of their goods in the various stages of transportation.

Today's irregular seasons can be attributed to adverse climatic circumstances Such that, either one severe flood wipes out the crops, or there is no rain, resulting in a drought. Due to the inability to store the valuable but volatile items for an extended period, farmers sometimes do not receive fair compensation for their output. Most rural residents were denied of farmers. Only a small number of options exist to reduce the financial burden of growing and storing crops forfarmers. Farmers might potentially boost their income by stockpiling goods and selling them during popular seasons. Due to a lack of available storage space, only a small number of farmers were compelled to make the trek from their farms to the facility. In order to maxi mise their earnings, farmers were forced to send their goodsto distant marketplaces. Local farmers had much less time for distribution and advertising as a result of the increased time required for farming.

Farmers whose commodities are stored in government warehouses have no means of knowing where their products are at any one time. Many farmers are likely to be easily deceived by agents into paying less than the fair price for their commodities due to their lack of awareness of the present status of their items and the market scenario. Therefore, it is critical to have a system that helps farmers track where their goods are and what condition they are in. Internet of Things is being used more and more in farming, but as the number of operating systems used in IoT expands, the resulting issues with IoT hierarchy become more.

Hence, an improved supply chain management is needed with the desired properties such as checkpoints at every stage in the supply chain management, verification of goods status by both the farmers and the government officials. In this paper, a system is proposed that uses Blockchain technology to attaintransparency about the goods' status that leads to a healthier relationship between the producer and consumer. By storing the details in the blockchain, all the processis visible both to the farmers and officials involved in the transportation.

A larger financial outlay is needed in rural regions to bring the form up to date with IoT. Therefore, it is important to make the most of the time and energy spent helping farmers improve their situation. It is more important to prevent middlemen from modifying crucial information about agricultural products including price, supply, and demand between producers and consumers.It is possible to do so by integrating the Internet of Things with the cutting edge blockchain technology. This study proposes a system based on Blockchain to keep records on the manyinitiatives available to farmers. The Blockchain network is the foundation of this technological advances. Well all operations between farmers, dealers, and clients may be recorded in a shared ledger using this decentralised method of data handling. Farmers, consumers, and intermediaries may all benefit from being ableto track price and quantity changes in the data. Each "block" with in Blockchain stores a number of separate events.

Each transaction must be confirmed by all parties before it can be included in a block. In order to establish a connection between two blocks in the system, the hash function of the prior block must be included in the new block. The immutability of blockchain storage is a major benefit for agricultural data. A new transaction must be generated if any information in the block has to be updated, including the price of agricultural products. In order for the buyer and the seller to see the revisedquote, the block is updated with the new event.

### 1.1 Overview

This is a standalone application allowing farmers to keep their agricultural products in this application and they every right to fix the price and quantity etc and the customers can login to this application after creating an account in it.The customers can directly buy from the farmers through this site with zero intermediary persons so that everyone can satisfy.Moreover through this application the farmers can increase or decrease the prices of their products according to the marketing strategies with more ease and fraction of time.There is more transparency , less manpower and requires only less time which brings more need for this application.

### 1.2 Problem Statement

In crop supply chain, 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.Thus there is a need for this application which would help not only the farmers but also for the customers.

# CHAPTER 2

# LITERATURE SURVEY

To that purpose, we evaluate and highlight published studies on blockchain promises for food and agriculture supply chains. One such research is "Block chain technology and agriculture industrial goods tracking: study advancementsand future problems" [1] by Giovannii Mirabeli. For this research, the authors gathered and examined the most relevant contributions to the written literature on the topic of block chain's usage in agriculture, with a focus on dietaryaccountability issues. Hormones and other compounds used often in farming aid in accelerating development and, therefore, increase field productivity. Specimen and rice are sometimes fortified with recycled mineral oil. These methods, taken together, undermine the economic value of agricultural products while also endangering public health. With only an eye on nutritional transparency, this research intends to undertake a research study of blockchain statements in agricultural stream chains. This lesson delves at the connection between blockchain technology and food tracing infrastructure.

In their work, Caro et al. [2] describe "AgriBlockIoT- A blockchain-based traceable system incorporating data collected from IoT devices throughout the value chain." Since need to divided, they built a use case for pursuing yield by connecting Ether & Hyperledger's processes. Smart contracts & DLT are discussed in detail in a study titled "Emerging Possibilities for the Utilization of Blockchain in the Farmer Industry" [3] by Mischa Tripoli et al. Dramatists are aware of the considerable potential DLTs offer for achieving long-term evolutiongoals, but they also realise the practical and executional barriers that prevent their full realisation. In their paper "A Ledger System to Enhance Consistency and Stability in the Food Logistics Chain," Gavina Baralla.

In Sardinia, they developed a system for regulating the flow of food, complete with a smart contract and blockchain built on the Ethereum platform. In order to promote responsible tourism and ensure the continued viability of Sardinia's indigenous crops, Barala. highlight the benefits of adopting this strategy. Review of Yunchuann Food .'s Tracking in the Supply Chain" [4].

This paper's dramatist has an unusual profession including FTSs; traceability methods may be linked with nourishment logistics; and competitor collaboration is boosted. The introduction of reliable and impactful tracking solutions requires substantial effort. Humanity, government, and science must give FTSs more credit than they often get. The focus of future study should be on figuring out how to utilise big data effectively in nutritional tracking schemes and improving the efficiency of traceable and transportation processes.

A whitepaper, “Bitcoin: A Peer-to-Peer Electronic Cash System”, mentioned the invention of Bitcoin was released decades ago (Nakamoto, 2008). It is the novel cryptocurrency attempt that endorsed trustworthy monetarist transactions deprived of a reliable principal authority (Tschorsch and Scheuermann, 2016). With the help of blockchain technology, Bitcoin resolves the imperfections associated with digital tokens as they can be easily replicated or created (van Hoek, 2019). Blockchain is a software engineering technology whose use is rapidly increasing, particularly in Pakistan, supporting smart city initiatives (Khan et al., 2020).

Blockchain technology is currently integrated with other sophisticated information systems such as the Enterprise Resource Planning system (Chofreh et al., 2011) that can optimise the performance of internal data control, transactions, and operations (Chofreh et al., 2015). Blockchain technology is also used in project management for more accurate and transparent project control to support success in managing projects (Chofreh et al., 2019).Blockchain is a ledger based on the concept of digital transactions supported by various machines that do not rely on reliable third parties (Erol et al., 2020). Separate files related to transaction data, known as blocks.

These blocks are accomplished with the help of a particular software platform that sends, processes, stores, and displays data in a human-readable form (Wang et al., 2019). Separately each block encloses a header with a timestamp in the bitcoin setup. Data associated with transactions and links to the previous block and each block is hashed, grounded in its content, and then referenced in the next block title (Zhang et al., 2019).Fig. 1 shows the blockchain encompassing n blocks.

Each of the following blocks includes the preceding block's hash, a timestamp, information regarding the transaction, the information regarding the nonce number intended for the excavating process and any further specificationsdesired for the practice to work. In addition to cryptocurrency and financial transactions, the importance of Blockchain technology has been known since 2014 (Tayeb and Lago, 2018). It includes management of records, digital mode authentication, initiating smart contracts, electronic voting, the transmission of locally created items, and tracking items (Dujak and Sajter, 2019). Blockchain achieves accomplishment and demonstrates its usage in several cryptocurrencies, and numerous organisations aim at connecting its transparency and fault tolerance for solving complications in situations where various mistrustful actors are indulged in the distribution of resources (Manski, 2017).A processing-based and organised agri-supply chain functions as a part of a very complex network. Figure 1 depicts a generic supply chain at the organization level within the context of a complete supply-chain network. Each firm is positioned in a network layer and belongs to at least one supply chain,i.e. it usually has multiple (varying) suppliers and customers at the same time and overtime.

## 2.1 INFERENCES FROM LITERATURE SURVEY

From the literature survey I have concluded some things which have to be modernised according to the current technologies.Many difficulties have plagued agriculture and food (agri-food) supply chains, including a lack of traceability, poor visibility, and inefficiency. These challenges have a direct and considerable impact onmanagement efforts to ensure agri-food production compliance, enhance food safety and quality, reduce food waste, and decrease supply chain operation expenditures. The advancement of a traditional supply chain becomes imperative in the case of unexpected growth of a product’s demand. Moreover, customer satisfaction can be improved with the help of supply chain management. A supply chain comprises operations such as product flow, information, and product travel history.

## 2.2 OPEN PROBLEMS IN EXISTING SYSTEM

The problems that we have in existing system are :

- No traceability
- No details of product origin
- No food safety is assured at any stage
- No record of any transaction in the whole supply chain.

The upper stated issues can be solved by blockchain technology; over distributed networks, it acts as a public ledger and overcomes information maintenance issues like verification and validation. Blockchain technology provides security, maintains temper proof record, avoids any kind of the third party of middle man in transactions, helps to reduce the overall cost of trans-action, and improves the product quality. The cryptographic approach followed here develops user confidence, resulting in increasing the product’s demand.

# CHAPTER 3

# REQUIREMENT ANALYSIS

## 3.1 FEASIBILITY STUDIES/RISK ANALYSIS OF THE PROJECT

The purpose of feasibility study is not to solve the problem but to determine if the problem is worth solving. The following feasibility studies have been performedto assess the feasibility of the system

- Operational Feasibility
- Technical Feasibility

***Operational feasibility***

This describes the ease with which the user can use the system. It verifies whether the proposed system can yield the expected results under the specified environment. It is observed that the design and implementation of the system makes the placement cell more user friendly.

***Technical Feasibility***

Technical feasibility checks the technical possibilities of the system to be developed. Necessary hardware and software resources to develop the system are readily available. No new technology is used for the design of applications. Therebyit can be more feasible. Other sources of information like books and the Internet are also available.

## 3.2 SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

The purpose of this document is to provide an insight into the requirements forthe development of application for the Blockchain based solution to improve the Supply Chain Management in Indian agriculture. The content of this document shall serve as a mutual agreement between the client and the designer/developerconcerning the functionality that the application should exhibit.

***TABLE 3.2.1: SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT***

| | |
|---|---|
| Operating System | Windows 10 |
| Language | HTML, PYTHON |
| Database | MySQL |
| Browser | Chrome |
| Web Server | Apache |
| Security purpose | Blockchain |

# CHAPTER 4

## DESCRIPTION OF PROPOSED SYSTEM

The food chain worldwide is highly multi-actor based and distributed, with numerous different actors involved, such as farmers, shipping companies, wholesalers and retailers, distributors, and groceries.In this proposed system there exists only farmers and customers.

The application which was built by us acts as a bridge between the farmers and the customers. In proposed system farmers provide their agriproducts to the alliance, which includes e-commerce companies and trusted organisations. Afterverification and successful product grading, the system writes the data into a new block on the blockchain via operating smart contracts. Based on the proposed system customers may buy products with high grades to insure product quality.

The information of the blockchain cannot be modified and thus customers cantrust the product grade. Meanwhile, the blockchain is a decentralized technology, and thus buyers can finish the verification of product grading via the BPGS efficiently and securely. Through this process the customers can have the satisfaction of buying products from the farmers which brings farmers profits.

### 4.1 SELECTED METHODOLOGY OR PROCESS MODEL

The basic design of the “Blockchain based solution to improve the supply chain management in Indian agriculture ” is made as per “WATERFALL Model” (also referred as “Classic Life Cycle Model”)The Methodology for the project follows the sequence of

- Analysis
- Design
- Code
- Test

***MODULARITY***

The “Blockchain based solution to improve the supply chain management in Indian agriculture”, is divided into four modules, which are dependent among themselves. And they are as follows:

- Product Management
- Customer Management
- Sales Management
- Order Management

## 4.2 ARCHITECTURE / OVERALL DESIGN OF PROPOSED SYSTEM

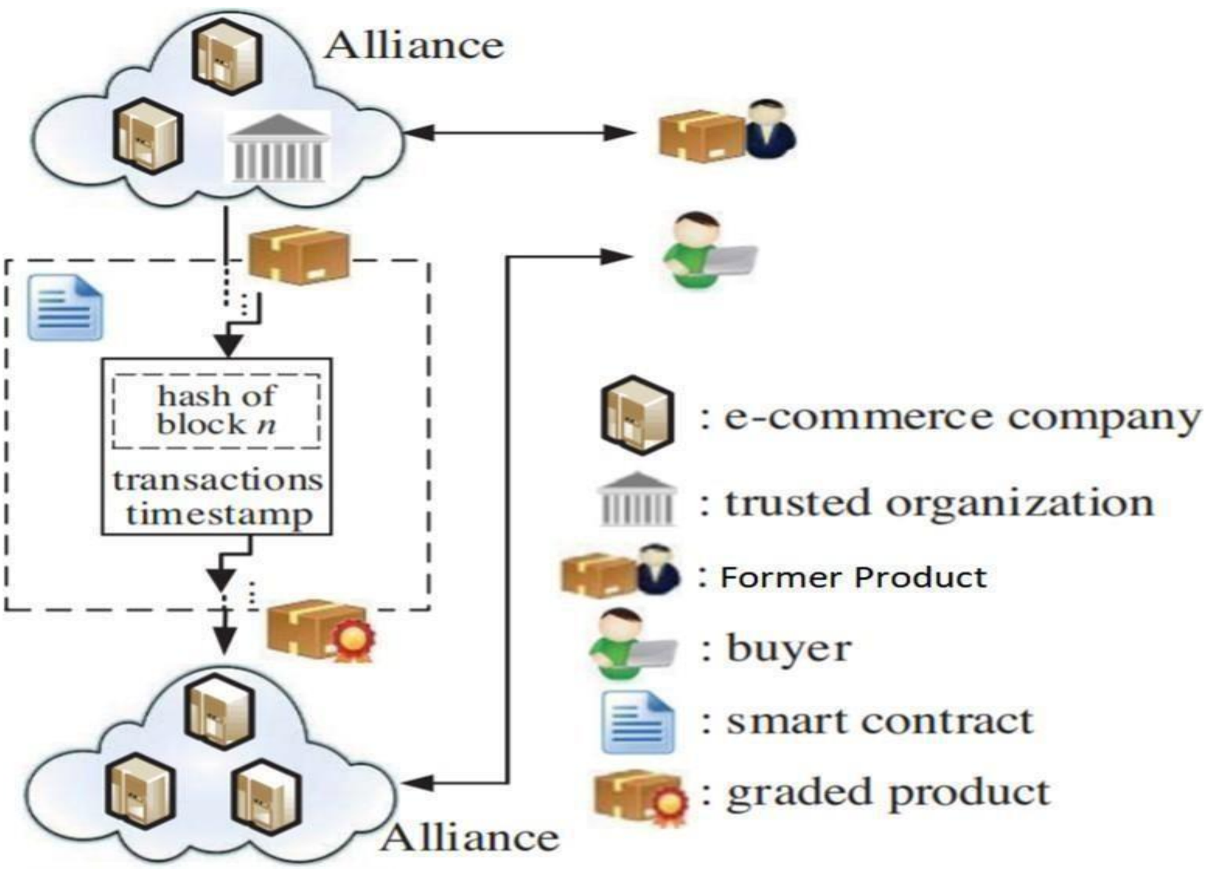


***Fig. 4.1: System Architecture***

The block diagram of the proposed system has been shown in the above figures. farmers provide their agriproducts to the alliance, which includes e-commerce companies and trusted organisations. After verification and successful product grading, the system writes the data into a new block on the blockchain via operating smart contracts.

Based on the proposed system customers may buy products with high grades to insure product quality. The information of the blockchain cannot be modified and thus customers can trust the product grade. Meanwhile, the blockchain is a decentralized technology, and thus buyers can finish the verification of product grading via the BPGS efficiently and securely.

## 4.3 DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED MODEL

The block diagram of the proposed system has been shown in the above figures. Admin is the key role for this web application because he can only authorize all the students and faculties information.The purpose of testing is to discover errors. Testing is the process of trying todiscover every conceivable fault or weakness in a work product.It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product. And it have the capability to think and takeactions in an write and accurate manner.It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not failin an unacceptable manner. There are various types of tests. Each test type addresses a specific testing requirement. System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizingpre-driven process links and integration points. The system testing in proposed system is used to check whether there are any advantages are disadvantages and also check the errors in the proposed modeland if there are any errors it will be identified.The identified errors will be checked once again after the implementation of the project. It is the most important step to run the project without any errors and alsogives the exact correction of the mistakes by using the several testing methods toensure the predictable results.

**4.4 PROJECT MANAGEMENT PLAN:**

A project management plan is a set of documents that outline the how, when and whatifs of a project's execution.It overviews the project's value proposition, execution steps, resources, communication tools and protocols, risks, stakeholders (and their roles) and thedeliverables involved in a project's completion.The below procedure needs to follow while deploying the application.

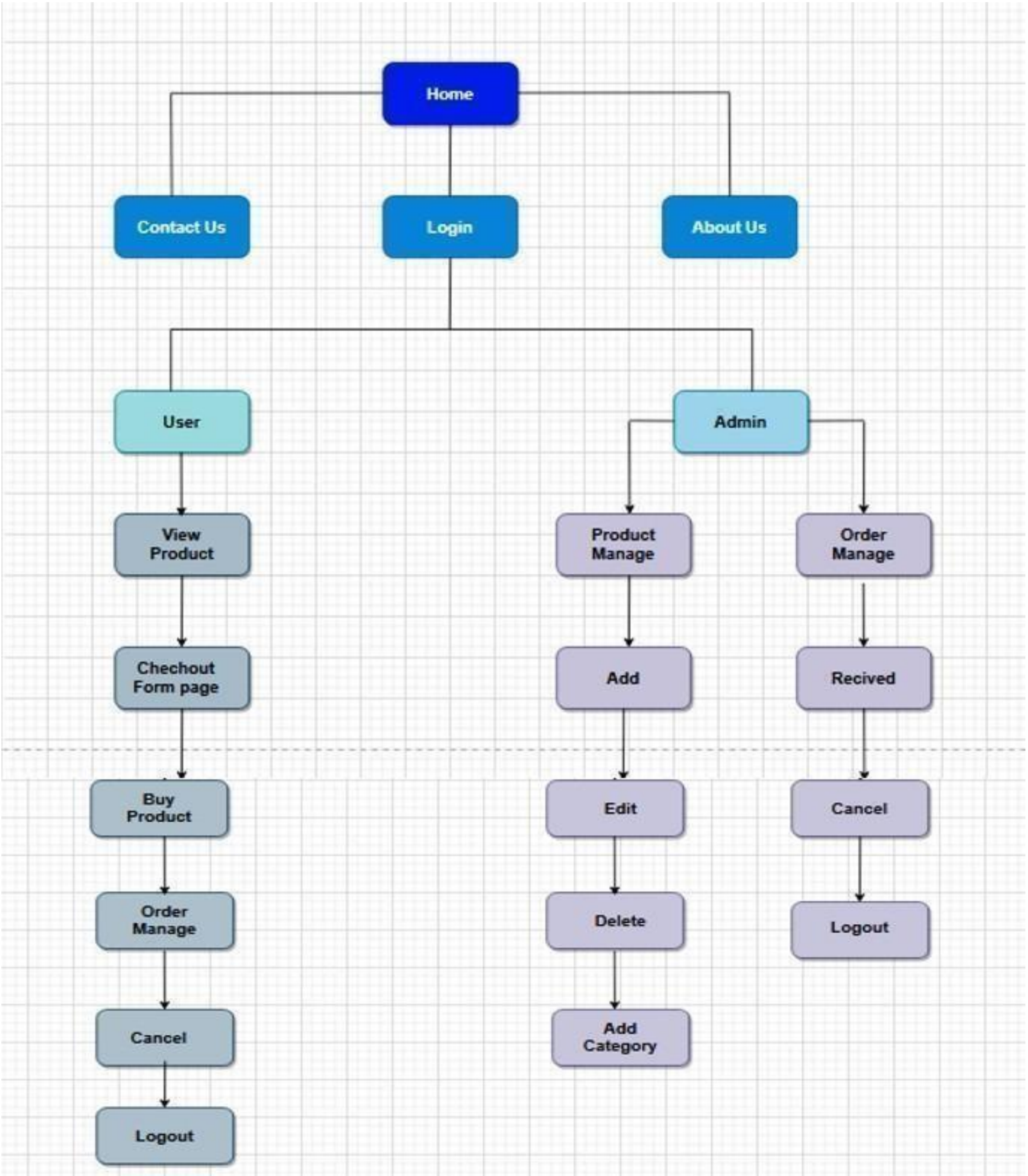


*Fig. 4.2: Flow Chart*

A project flow diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases.The main purpose of a use case diagram is to show what system functions areperformed for which actor. Roles of the actors in the system can be depicted. Aflowchart diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order.

It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams. Flowcharts are nothing but the graphical representation of the data or thealgorithm for a better understanding of the code visually.It displays step-by-step solutions to a problem, algorithm, or process. It is a pictorial way of representing steps that are preferred by most beginner-level programmers to understand algorithms of computer science, thus it contributes totroubleshooting the issues in the algorithm.

A flowchart is a picture of boxes that indicates the process flow in a sequential manner. Since a flowchart is a pictorial representation of a process or algorithm,it's easy to interpret and understand the process.Flowcharts are nothing but the graphical representation of the data or the algorithm for a better understanding of the code visually. It displays step-by-step solutions to a problem, algorithm, or process.It is a pictorial way of representing steps that are preferred by most beginner-level programmers to understand algorithms of computer science, thus it contributes to troubleshooting the issues in the algorithm.A flowchart is a picture of boxes that indicates the process flow in a sequential manner. Since a flowchart is a pictorial representation of a process or algorithm, it's easy to interpret and understand the process. To draw a flowchart, certain rules need to be followed which are followed by allprofessionals to draw a flowchart and is widely accepted all over the countries.

### 4.5 FINANCIAL REPORT ON ESTIMATED COSTING

This study is carried out to check the economic impact that the system will haveon the organization. The amount of funds that the company can pour into the research and development of the system is limited.The expenditures must be justified. Thus the developed system as well within thebudget and this was achieved because most of the technologies used are freely available.Only the customized products had to be purchased. Cost estimation is the process of approximating the cost of a policy, program or project and is importantin establishing the basis for key spending and investment decisions.

Following best practice principles for cost estimation help ensure the efficient use of public resources and minimize the risk of the project. For investment proposals there is typically a source of revenue that can be capitalized therefore facilitating the use of an investment or financing instrument. Testing the veracity of the assumptions underpinning revenue projections is equally as important as the strength of the cost estimation process. There arethree components of a capital cost estimate for a major project. The base estimate, contingency and escalation. The Base Estimate is the best assessment of the quantities and rates associated with a given scope of work according to a defined estimating practice or policy.The Base Estimate consists of two components – Construction Costs and Client Costs.Cost estimation is the process of approximating the cost of a policy, program or project and is important in establishing the basis for key spending and investment decisions.Following best practice principles for cost estimation help ensure the efficient useof public resources and minimize the risk of cost overruns. It is helpful to find theactual cost.

### 4.6 TRANSITION/SOFTWARE IN OPERATIONS PLANS

This entire “lost in transition” scenario could have been avoided if the project team included operations support planning and transition early on in the project planning and schedule development.The project team solved the problem by implementing the following six simple steps to improve application governance and improve operational support.

***1. Identify support resources for the application***

Even in resource constrained organizations, it is important to have an individual resource or team responsible for production support. Depending on the volume, the role may be shared or dedicated to production support and application management.

***2. Establish an operations status meeting with business partners and IT stakeholders.***

An operations status meeting is similar to a project status meeting except the focus is on the operations of the IT application and the results being delivered to the business. The operations status meeting includes business partners and IT management to jointly review the health and performance of the application. The main focus of this meeting is on the operations of the IT applications and also it isknown as operation status meeting.

***3. Establish a production issues and incidents meeting with businesssubject matter experts and the technical team.***

By establishing a separate meeting to review production issues and incidents, the project team can focus on issues relevant to the next release while the operations team focuses on immediate support issues. Failing to separate production issues from project issues will only drain the project team from their intended goals and objectives. The end user becomes confused as they struggle with identifying a single point of contact for assistance.

***4. Establish a change control board to manage ongoing change in the operational environment.***

Change management is an ongoing operational process as well as a project management process area. Business needs will change and new reports, fields, interfaces and customizations will be needed. Some of these enhancements can be bundled with a future software release and others will be made off-cycle based on the request's severity.By establishing a change control board, the business customer will have a method to request changes to the application without deterring the project team from their intended goal. The changes introduced to the change control board should also be vetted and reviewed with the project team to ensure there are noimpacts or conflicts.

***5.Communicate the governance model to project stakeholders***

Once the participants are identified for each of the key operational meetings, the operations governance model should be communicated and reviewed by business and IT stakeholders. By presenting a solution on how issues, changes and operational status will be reviewed, the business partners will have greater confidence in the IT manager’s role in delivering services and supporting the business.

***6.Provide knowledge transfer between project team and support team*.**

Another key to a successful operations process is the knowledge transfer provided by the project team to the operational support team. In some cases, project team members will become operational support and in other cases, newoperations support teams will be hired independent of the project. The project schedule should include transition documentation tasks to communicate the processes and procedures required to support the application.The processes documentation can include batch schedules, help desk coordination, escalation contacts, known problems and solutions, and disaster recovery procedures. Readers may be surprised that even a seasoned projectteam could get “lost in transition”, but it often happens when projects are facedwith insufficient resources and short timelines.

# CHAPTER 5

# IMPLEMENTATION DETAILS

The project implementation plan is a critical component of project management that focuses on documenting how you'll go about a project.Project implementation plan should include everything from project goals to deliverables and act as a blueprint for the project team to execute their plans. Every project is different and requires a unique planning and implementation plan.And since 11.4% of business investment is wasted because of poor projectplanning, companies need to ensure that their project planning and management are strategic and efficient.

### 5.1 DATABASE

Proper database design makes a system efficient and effective. The databasemust be normalized to receive the goal of efficiency.The "First Normal Form" (Each field in Table must convey unique information) is followed in the design of the System.The "Second Normal Form" (No field must derive from another field) is also followed in the design of the System.In addition to the above, "Third Normal Form" (No Duplicate informationthroughout the database) is also followed.As a whole the system follows the normalization process for complete Database design.

***TABLE NAME*** : Admin

***PURPOSE*** : Maintain the user and admin details

***PRIMARY KEY*** : id

***Table 5.1 Admin Database***

| FIELD | DATA TYPE | CONSTRAINT | DESCRIPTION |
|---|---|---|---|
| id | int(11) | Primary Key | Id |
| first_name | varchar(20) | Null | First name |
| last_name | varchar(20) | Null | Last name |
| email | varchar(255) | Null | email |

**TABLE NAME :** Ordered_items

**PURPOSE :** Maintain Product information

**PRIMARY KEY :** id

*Table 5.2 Ordered_items Database*

| FILED NAME | DATA TYPE | CONSTRAINT | DESCRIPTION |
|---|---|---|---|
| Item_id | int(11) | Primary Key | Item id |
| Cart_id | int(11) | Null | Cart id |
| Agriculut ure ods | int(11) | Not Null | Agriculture Goods id |
| Qty | int(11) | Null | Quantity |
| Price | Float | Null | Price of the Product |
| Status | int(2) | Not Null | Status of the Product |

## 5.2 TESTING PLAN OF THE PROPOSED MODEL/SYSTEM

Testing is the process of executing a program with the intent of finding errors. If testing is conducted successfully it will uncover errors in the software. The objective of testing is to find the greatest possible number of errors with a manageable amount of effort applied over a realistic time span. The different verification and validation techniques are part of testing.Test cases are designed and their outcome is found out manually. Each test case tells what to do, what data to use and what result to expect. The output of the program with these test cases as input is noted and compared with the corresponding manual results.

### *Unit Testing*

All the modules in this project have been individually tested. This test detects errors in coding and logic with each module. The module was tested and checked for its consistency.After the code has been developed, reviewed and verified for correspondence to component level design, unit test cases were designed. Each test case was coupled with a set of expected results.

***Stress Testing***

Entering an unexpected value as data is given to the module an error message will appear. For example if we give negative values for installment amount then the error message should appear “loan amount should not be negative”. So that the user will be made aware of these mistakes and enter the correct data.

***System Testing***

System Testing is a verification of the system with its initial objectives. The entire system is tested. The testing is done to see if the system developed meets all the requirements of the users. The outputs of the system were found to be correct. System testing involves two kinds of activities: Integration Testing and Acceptance Testing.

***Integration Testing***

Any software system is complete only if all the sub-systems are integrated and work in harmony. This testing is a systematic technique for constructing theprogram structure while at the same time conducting tests to uncover errors associated with interfacing. The unit-tested components are taken to build aprogram structure that has been dictated by the design.All modules are integrated by giving input to each module to check for the correctness of the output. The integration system is carried out for the results to be proved as accurate.

***Acceptance Testing***

Acceptance Testing is carried out to determine how for the user’s system, requirements and needs are satisfied. The actual users are made to test the integrated system. We tested our applications by giving it to the user and the user needs are satisfied.

***Regression testing***

Regression testing is the re- execution of some subset of tests that have already been conducted to ensure that changes have not propagated unintended side effects. This testing is applied to ensure that no side effects occur.

# RESULT & CONCLUSION

## 6.1 RESULT

Our project is only a humble venture to satisfy the needs to manage their project requirements. Several user-friendly coding have also been adopted. This package shall prove to be a powerful package in satisfying all the requirements of the café. The objective of software planning is to provide a framework that enables the admin to make reasonable estimates made within a limited time frame at the beginning of the project and should be updated regularly as the project progresses. It has all the potential to revolutionize allthe agricultural supply chain management by enhancing transparency, traceability and efficiency.

## 6.2 RESEARCH ISSUES

Blockchain technology has the potential to revolutionize the way agricultural supply chains are managed. Some research issues in agriculture supply chain management based on blockchain are:

***Traceability:*** One of the most significant benefits of blockchain in the agriculture supply chain is the ability to trace the origin of products. However, there is a need to develop standards and protocols for capturing and sharing data across the supply chain. This requires collaboration between stakeholders in the supply chain, including farmers, processors, distributors, and retailers.

***Data privacy and security*:** Blockchain technology relies on the sharingof data across a decentralized network, which raises concerns around data privacy and security. Research is needed to develop secure and transparent data sharing protocols that protect the privacy of individuals

***Interoperability:*** The agriculture supply chain involves multiple stakeholders, each with their own systems and processes. To effectively implement blockchain-based solutions, there is a need to ensure interoperability between different systems and protocols.

***Adoption and implementation*:** While blockchain technology holds great promise for improving the transparency and efficiency of the agriculture supply chain, there are challenges to adoption and implementation. These challenges include the cost and complexity of implementing blockchain solutions, as well as the need for education and training for stakeholders.

***Governance and regulation***

The decentralized nature of blockchain technology raises questions around governance and regulation. There is a need for clear guidelines and standards around the use of blockchain in agriculture supply chain management to ensure transparency, fairness, and accountability.

***Sustainability:***

Blockchain technology can help track the sustainability of agricultural practices, but there is a need to develop metrics and standards for measuring sustainability. This requires collaboration between stakeholders in the supply chain, as well as input from experts in sustainability and environmental science.Overall, research in agriculture supply chain management based on blockchainis a rapidly evolving area that requires collaboration between stakeholders in the supply chain, as well as input from experts in technology, data privacy, sustainability, and regulation.

# CHAPTER 7

# FUTURE WORK

There is always a room for improvement in any software package, however good and efficient it may be. But the improvement requires that the system should be flexible enough for further modification. Considering this important factor, the system is designed in such a way that further enhancement without affecting the system's development.This package can be enhanced to include features for connecting various branches and allowing information sharing using public or private networks. The information produced by this system can be used to maintain many other details.We can give more advance software for Online AgriOnline ManagementSystem including more facilities.We can add online payment for future enhancementBlockchain technology has the potential to transform the agriculture supply chain management by providinga transparent and secure platform for tracking and recording information about the entire supply chain, from the farm to the consumer.Here are some potential future works in this area:Traceability and transparency: Blockchain technology can be used to provide end-to-end traceability and transparency in the agricultural supply chain. Farmers can use the blockchain to record information about their crops, such as the date of planting, the type of fertilizers and pesticides used, and the date of harvest. This information can then be shared with the supply chain stakeholders, such as distributors, retailers, and consumers, to provide them with an accurate and transparent view of the entire supply chain.

***Quality assurance:*** Blockchain technology can also be used to provide quality assurance for agricultural products. By recording information about the origin and quality of the crops, as well as the transportation and storage conditions, the blockchain can help ensure that the products meet the required standards and regulations.

***Supply chain optimization:*** Blockchain technology can be used to optimize the agricultural supply chain by reducing inefficiencies and improving communication between the different stakeholders. By providing a shared platform for data management and communication, the blockchain can help reduce transaction costs and improve the speed and efficiency of the supply chain.

***Payment and financing:*** Blockchain technology can also be used to facilitate payments and financing in the agricultural supply chain. By using smart contracts, farmers can receive payments automatically when their crops are sold, without the need for intermediaries. This can help reduce transaction costs and improve the financial viability of smalland medium-sized farmers.

Sustainability and social responsibility: Finally, blockchain technology can be used to promote sustainability and social responsibility in the agricultural supply chain. By recording information about the environmental and social impact of agricultural practices, the blockchain can help consumers make more informed choices and encourage farmers to adopt more sustainable and responsible practices.Overall, blockchain technology has the potential to transform the agriculture supply chain management by providing a secure, transparent, and efficientplatform for tracking and recording informationabout the entire supply chain. As the technology continues to evolve and mature, we can expect to see more innovative applications and solutions in this area.

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# APPENDIX

## A.Source Code

```
from decimal import Decimal
from django.conf import settings
from efarm.models import Crop



class Cart(object):
    def___init__(self, request):
        self.session = request.session
        cart = self.session.get(settings.CART_SESSION_ID)
        if not cart:
            cart = self.session[settings.CART_SESSION_ID] = {}
        self.cart = cart

    def add(self, crop, quantity=1, update_quantity=False):
        product_id = str(crop.id)
        if product_id not in self.cart:
            self.cart[product_id] = {'quantity': 0, 'price': str(crop.price)}
        if update_quantity:
            self.cart[product_id]['quantity'] = quantity
        else:
            self.cart[product_id]['quantity'] += quantity
        self.save()

    def save(self):
        self.session[settings.CART_SESSION_ID] = self.cart
        self.session.modified = True

    def remove(self, crop):
        product_id = str(crop.id)
        if product_id in self.cart:
```

```
    del self.cart[product_id]def iter___(self):
        product_ids = self.cart.keys()
        products = Crop.objects.filter(id__in=product_ids)
        for product in products:
            self.cart[str(product.id)]['product'] = product

        for item in self.cart.values():
            item['price'] = Decimal(item['price'])
            item['total_price'] = item['price'] * item['quantity']
            yield item

    def___len__(self):
        return sum(item['quantity'] for item in self.cart.values())

    def get_total_price(self):
                return   sum(Decimal(item['price'])   *   item['quantity']   for item in
     self.cart.values())

    def clear(self):
        del self.session[settings.CART_SESSION_ID]
        self.session.modified = True
from django.shortcuts import render, redirect, get_object_or_404
from django.views.decorators.http import require_POST
from efarm.models import Crop
from .cart import Cart
from .forms import CartAddProductForm


@require_POST
def cart_add(request, product_id):
    cart = Cart(request) # create a new cart object passing it the request object
    crop = get_object_or_404(Crop, id=product_id)
    form = CartAddProductForm(request.POST)
```

```
    if form.is_valid():
        cd = form.cleaned_data
        cart.add(crop=crop, quantity=cd['quantity'], update_quantity=cd['update'])
    return redirect('cart:cart_detail')


def cart_remove(request, product_id):
    cart = Cart(request)
    product = get_object_or_404(Crop, id=product_id)
    cart.remove(product)
    return redirect('cart:cart_detail')


def cart_detail(request):
    cart = Cart(request)
    for item in cart:
                item['update_quantity_form'] = CartAddProductForm(initial={'quantity':
     item['quantity'], 'update': True})
    return render(request, 'cart/detail.html', {'cart': cart})
from django.db import migrations, models
import django.db.models.deletion


class Migration(migrations.Migration):

    initial = True

    dependencies = [
    ]

    operations =
        [ migrations.CreateMode
        l(
            name='Crop',
```

```
('id', models.AutoField(auto_created=True, primary_key=True,serialize=False,
verbose_name='ID')),
        ('crop_name', models.CharField(max_length=254)),
        ('slug', models.SlugField(max_length=100)),
        ('crop_description', models.CharField(max_length=254)),
        ('crop_image', models.ImageField(upload_to='crop_image')),
        ('location', models.CharField(max_length=100)),
        ('contact_no', models.IntegerField()),
        ('zip_code', models.CharField(max_length=20)),
        ('state', models.CharField(max_length=100)),
        ('country', models.CharField(max_length=100)),
        ('now', models.DateTimeField(auto_now_add=True)),
        ('exp', models.DateTimeField(auto_now_add=True)),
        ('price', models.FloatField(default=0.0)),
        ('quantity', models.IntegerField(default=0)),
     ],
  ),
  migrations.CreateModel(
     name='CropCategory',
     fields=[
                 ('id', models.AutoField(auto_created=True, primary_key=True,
serialize=False, verbose_name='ID')),
        ('name', models.CharField(db_index=True, max_length=150)),
        ('slug', models.SlugField(max_length=150, unique=True)),
        ('created_at', models.DateTimeField(auto_now_add=True)),
        ('updated_at', models.DateTimeField(auto_now=True)),
     ],
     options={
        'verbose_name': 'category',
        'verbose_name_plural': 'categories',
        'ordering': ('name',),
     },
  ),
  migrations.CreateModel(
```

```
    name='UserModel',
    fields=[
            ('id', models.AutoField(auto_created=True, primary_key=True,
serialize=False, verbose_name='ID')),
        ('f_name', models.CharField(max_length=254)),
        ('l_name', models.CharField(max_length=254)),
        ('mobile', models.CharField(max_length=254)),
        ('email', models.EmailField(max_length=254)),
        ('type', models.CharField(max_length=254)),
        ('password', models.CharField(max_length=254)),
        ('address', models.CharField(max_length=100)),
        ('zip_code', models.CharField(max_length=20)),
        ('state', models.CharField(max_length=100)),
        ('country', models.CharField(max_length=100)),
        ('gender', models.CharField(max_length=254)),
        ('dob', models.DateField()),
    ],
  ),
  migrations.AddField(
    model_name='crop',
    name='category',

field=models.ForeignKey(on_delete=django.db.models.deletion.CASCADE,
related_name='crops', to='efarm.CropCategory'),
  ),
   ]
   import os

   # Build paths inside the project like this: os.path.join(BASE_DIR, ...)
   BASE_DIR = os.path.dirname(os.path.dirname(os.path.abspath(__file__)))
   TEMPLATES_DIR=os.path.join(BASE_DIR,"templates")#added
   STATIC_DIR=os.path.join(BASE_DIR,"static")

   # Quick-start development settings - unsuitable for production
```

```
# See https://docs.djangoproject.com/en/2.1/howto/deployment/checklist/

# SECURITY WARNING: keep the secret key used in production secret!
SECRET_KEY = ')zmv71rrwl*lod*b6fr4%)h$h+jy3^89fbh#qixf#$$@m-4h$h'

# SECURITY WARNING: don't run with debug turned on in production!
DEBUG = True

ALLOWED_HOSTS = []


# Application definition

INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'imagekit',
    'efarm',
    'cart',
    'orders'
]

MIDDLEWARE = [
    'django.middleware.security.SecurityMiddleware',
    'django.contrib.sessions.middleware.SessionMiddleware',
    'django.middleware.common.CommonMiddleware',
    'django.middleware.csrf.CsrfViewMiddleware',
    'django.contrib.auth.middleware.AuthenticationMiddleware',
    'django.contrib.messages.middleware.MessageMiddleware',
    'django.middleware.clickjacking.XFrameOptionsMiddleware',
```

```
]

ROOT_URLCONF = 'farmingShop.urls'

TEMPLATES = [
    {
        'BACKEND': 'django.template.backends.django.DjangoTemplates',
        'DIRS': [TEMPLATES_DIR,],
        'APP_DIRS': True,
        'OPTIONS': {
            'context_processors':
                [ 'django.template.context_processors.debug',
                'django.template.context_processors.request',
                'django.contrib.auth.context_processors.auth',
                'django.contrib.messages.context_processors.messages',
                'cart.context_processors.cart',
            ],
        },
    },
]

WSGI_APPLICATION = 'farmingShop.wsgi.application'


# Database
# https://docs.djangoproject.com/en/2.1/ref/settings/#databases

DATABASES = {
    'default': {
        'ENGINE': 'django.db.backends.sqlite3',
        'NAME': os.path.join(BASE_DIR, 'db.sqlite3'),
    }
}
```

```
# Password validation
#
https://docs.djangoproject.com/en/2.1/ref/settings/#auth-password-validators

AUTH_PASSWORD_VALIDATORS = [
    {'NAME':
'django.contrib.auth.password_validation.UserAttributeSimilarityValidator',
    },
    {
                                                                          ':

'django.contrib.auth.password_validation.MinimumLengthValidator',
    },
    {

'django.contrib.auth.password_validation.CommonPasswordValidator',
    },
    {

'django.contrib.auth.password_validation.NumericPasswordValidator''
LANGUAGE_CODE = 'en-us'
TIME_ZONE = 'UTC'
USE_I18N  =  True
USE_L10N = True
USE_TZ = True
# Static files (CSS, JavaScript, Images)
# https://docs.djangoproject.com/en/2.1/howto/static-files/
CART_SESSION_ID = 'cart'
STATIC_URL = '/static/'
```

```
STATICFILES_DIRS=[
    STATIC_DIR,
]
MEDIA_URL = '/media/'
MEDIA_ROOT = os.path.join(BASE_DIR, 'products/')
from django.contrib import admin
from django.urls import path, include
from django.conf.urls.static import static
from django.conf import settings
urlpatterns = [
    path('admin/', admin.site.urls),
    path('efarm/',include('efarm.urls')),
    path('cart/', include('cart.urls')),
    path('orders/', include('orders.urls')),
]+ static(settings.MEDIA_URL, document_root=settings.MEDIA_ROOT)
from django.db import migrations, models
import django.db.models.deletion


class Migration(migrations.Migration):

    initial = True

    dependencies =
        [ ('efarm',
        '0001_initial'),
    ]

    operations =
        [ migrations.CreateMode
        l(
            name='Order',
            fields=[
                    ('id', models.AutoField(auto_created=True, primary_key=True,
```

```
                ('last_name', models.CharField(max_length=60)),
                ('email', models.EmailField(max_length=254)),
                ('address', models.CharField(max_length=150)),
                ('postal_code', models.CharField(max_length=30)),
                ('city', models.CharField(max_length=70)),
                ('city2', models.CharField(max_length=50)),
                ('created', models.DateTimeField(auto_now_add=True)),
                ('updated', models.DateTimeField(auto_now=True)),
                ('paid', models.BooleanField(default=False)),
            ],
            options={
                'ordering': ('-created',),
            },
        ),
        migrations.CreateModel(
            name='OrderItem',
            fields=[
                    ('id', models.AutoField(auto_created=True, primary_key=True,
serialize=False, verbose_name='ID')),
                ('price', models.DecimalField(decimal_places=2, max_digits=10)),
                ('quantity', models.PositiveIntegerField(default=1)),
                                                                        ('order',
models.ForeignKey(on_delete=django.db.models.deletion.CASCADE,
related_name='items', to='orders.Order')),
                                                                        ('product',
models.ForeignKey(on_delete=django.db.models.deletion.CASCADE,
related_name='order_items', to='efarm.Crop')),
            ],
        ),
    ]

from django.contrib import admin
from .models import Order, OrderItem
class OrderItemInline(admin.TabularInline):
```

```
        model = OrderItem
        raw_id_fields = ['product']
    class OrderAdmin(admin.ModelAdmin):
            list_display = ['id', 'first_name', 'last_name', 'email', 'address',
'postal_code', 'city', 'paid', 'created',
                'updated']
        list_filter = ['paid', 'created', 'updated']
        inlines = [OrderItemInline]
    admin.site.register(Order, OrderAdmin)
    from django.apps import AppConfig
    class OrdersConfig(AppConfig):
        name = 'orders'
    from django.db import migrations, models


    class Migration(migrations.Migration):

        dependencies =
            [ ('efarm',
            '0001_initial'),
        ]

        operations =
            [ migrations.AlterFiel
            d(
                model_name='usermodel',
                name='type',
                 field=models.CharField(choices=[('customer', 'Customer'), ('farmer',
'Farmer')], max_length=254),
            ),
        ]
    from django.db import migrations, models
```

```
    dependencies = [
        ('efarm', '0002_auto_20190418_0056'),
    ]

    operations =
        [ migrations.CreateMode
        l(
            name='feedback',
            fields=[
                    ('id', models.AutoField(auto_created=True, primary_key=True,
serialize=False, verbose_name='ID')),
                ('cust_name', models.CharField(max_length=254)),
                ('cust_email', models.EmailField(max_length=254)),
                ('subject', models.CharField(max_length=50)),
                ('cust_msg', models.CharField(max_length=50)),
            ],
        ),
    ]
from django.db import migrations, models


class Migration(migrations.Migration):

    dependencies = [
        ('efarm', '0003_feedback'),
    ]

    operations =
        [ migrations.AlterFiel
        d(
            model_name='feedback',
            name='cust_msg',
            field=models.TextField(max_length=254),
        ),
```

```
from imagekit.models import ImageSpecField
from imagekit.processors import ResizeToFill
from django.urls import reverse
import datetime
class UserModel(models.Model):
    f_name = models.CharField(max_length=254)
    l_name = models.CharField(max_length=254)
    mobile = models.CharField(max_length=254)
    email = models.EmailField(max_length=254)
                                                            type                =
models.CharField(max_length=254,choices=(('customer','Customer'),('farmer','
Farmer')) )
    password = models.CharField(max_length=254)
    address = models.CharField(max_length=100)
    zip_code = models.CharField(max_length=20)
    state = models.CharField(max_length=100)
    country = models.CharField(max_length=100)
    gender = models.CharField(max_length=254)
    dob = models.DateField()

    def___str_(self):
                    return    "FirstName:     {0}\nLastName:       {1}\nEmail:
{2}".format(self.f_name, self.l_name, self.email)
    def get_absolute_url(self):
        return reverse('efarm:welcome', args=[self.id])




class CropCategory(models.Model):
    name = models.CharField(max_length=150, db_index=True)
    slug = models.SlugField(max_length=150, unique=True ,db_index=True)
    created_at = models.DateTimeField(auto_now_add=True)
    updated_at = models.DateTimeField(auto_now=True)
```

```
        class Meta:
            ordering = ('name',  )
            verbose_name = 'category'
            verbose_name_plural = 'categories'


        def___str_(self):
            return self.name

        def get_absolute_url(self):
            return reverse('efarm:crop_list_by_category', args=[self.slug])


    class Crop(models.Model):
        farmer_id= models.IntegerField()
        crop_name = models.CharField(max_length=254)
        slug = models.SlugField(max_length=100, db_index=True)
            category = models.ForeignKey(CropCategory, related_name='crops',
on_delete=models.CASCADE)
        crop_description = models.CharField(max_length=254)
        crop_image = models.ImageField(upload_to='crop_image')
        crop_thumbnail = ImageSpecField(source='crop_image',
                                    processors=[ResizeToFill(100, 50)],
                                    format='JPEG',
                                    options={'quality': 60})
        location = models.CharField(max_length=100)
        contact_no = models.IntegerField()
        zip_code = models.CharField(max_length=20)
        state = models.CharField(max_length=100)
        country = models.CharField(max_length=100)
        now = models.DateTimeField(auto_now_add=True, blank=True)
        exp = models.DateTimeField(auto_now_add=True)
        price = models.FloatField(default=0.0)
```

```
    quantity = models.IntegerField(default=0)
    class meta:
        ordering = ('crop_name', )
        index_together = (('id', 'slug'),)



    def___str_(self):
        return "{0}".format(self.crop_name)

    def get_absolute_url(self):
        return reverse('efarm:crop_detail', args=[self.id, self.slug])


class feedback(models.Model):
    cust_name=models.CharField(max_length=254)
    cust_email = models.EmailField(max_length=254)
    subject = models.CharField(max_length=50)
    cust_msg = models.TextField(max_length=254)
    def___str_(self):
        return self.subject
```

## B.SCREENSHOTS

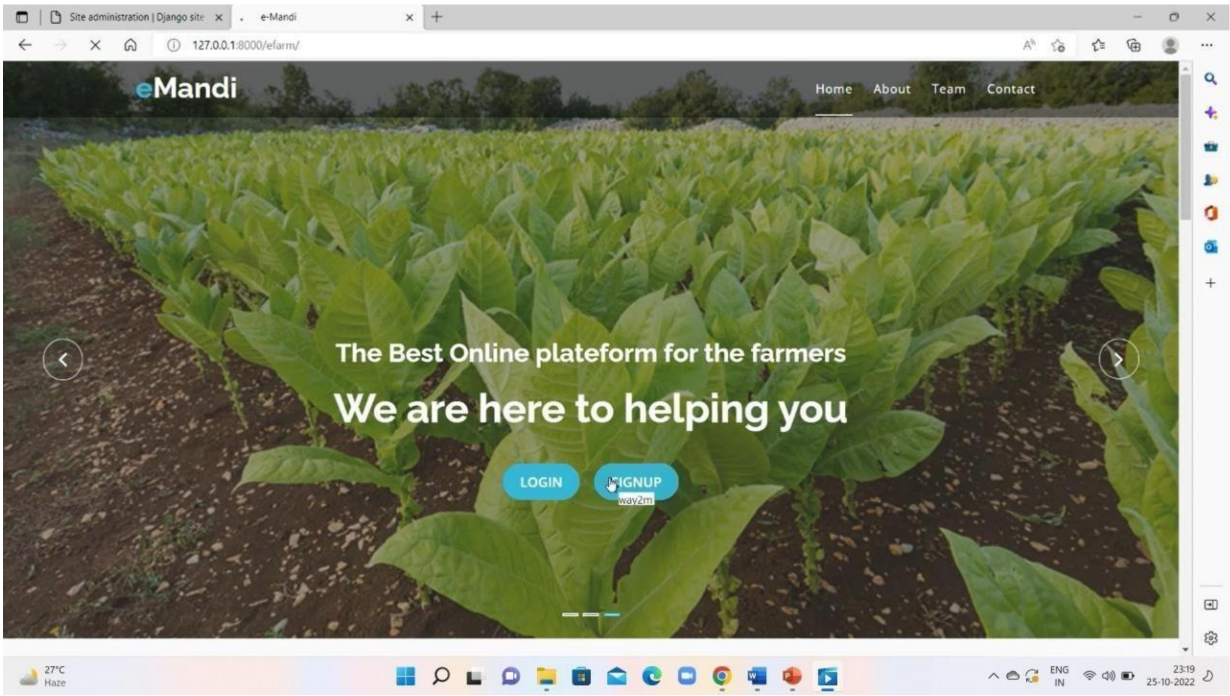


Fig B.1 Farmer login/signup page

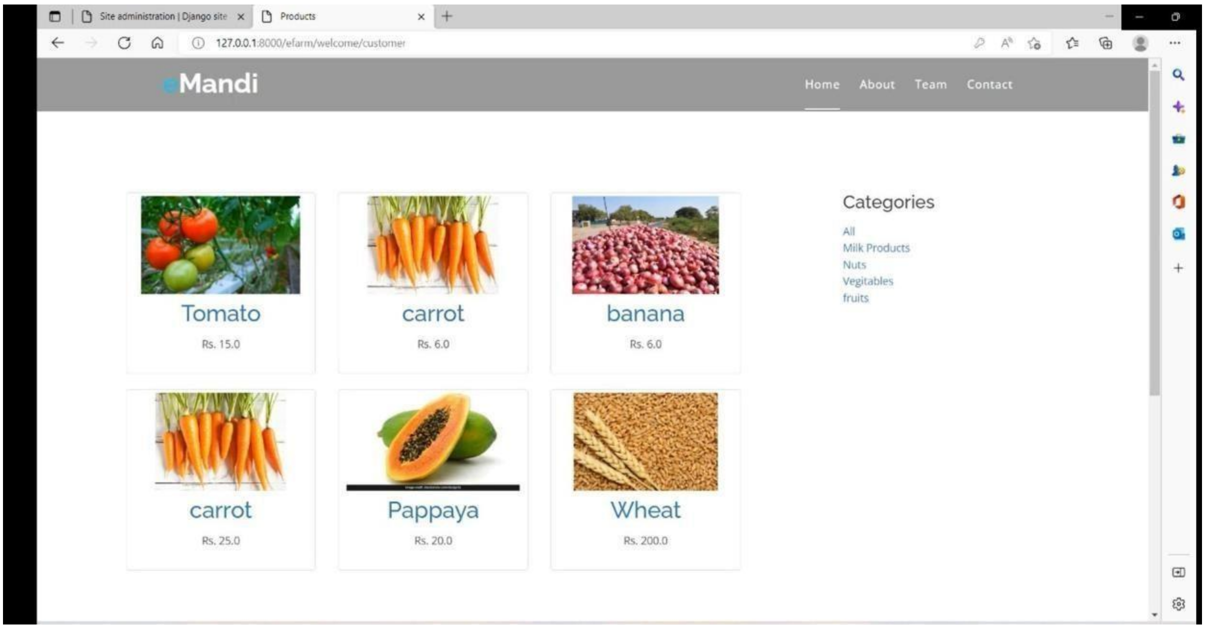


Fig B.2 Customer home page

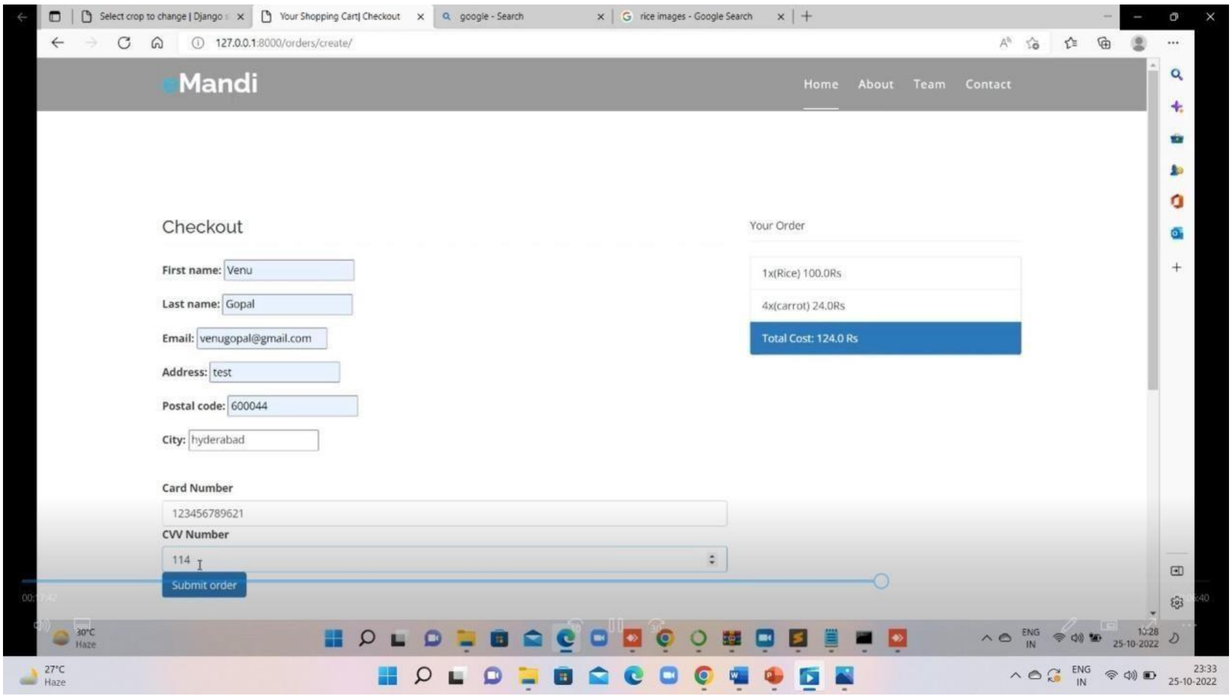


**fig B.3 Customer checkout page**

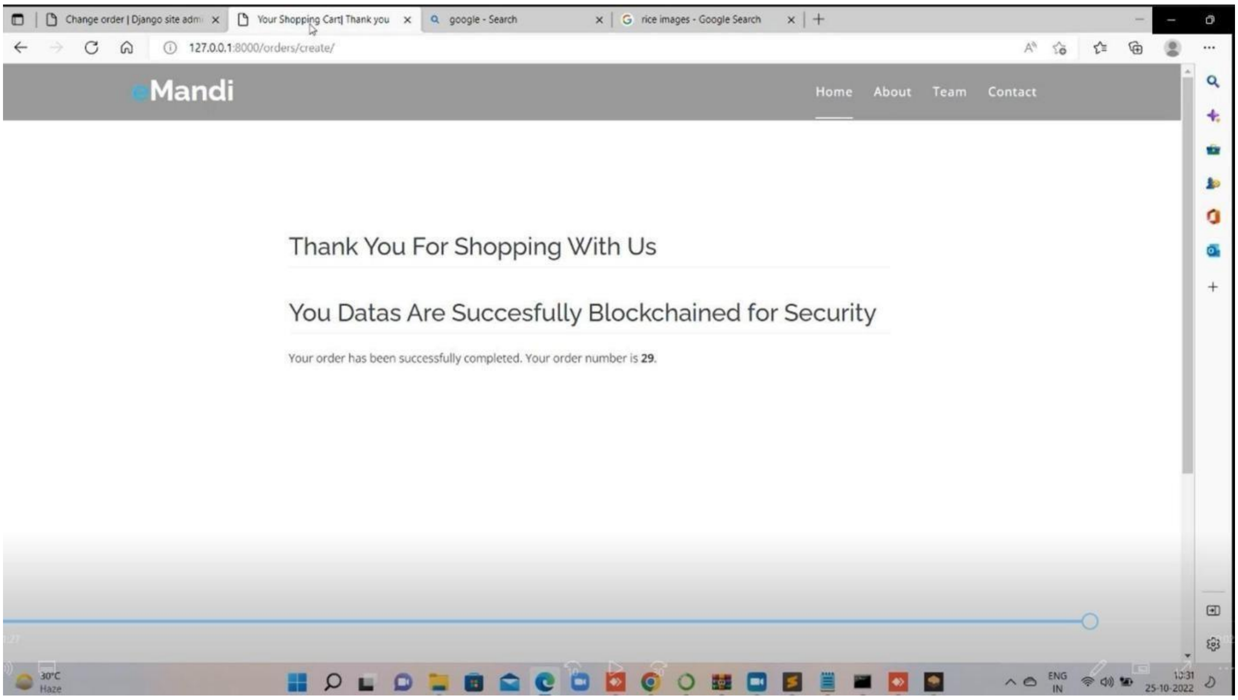


**fig B.4  Customer Leaving page after shopping**

**C.RESEARCH PAPER**

# Proposal utilizing the Blockchain technology to enhance management of supply chains in Indian agriculture


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***Abstract*—In the global agricultural scene, India is a prominent role. Agriculture in India has its origins in the Indus Valley Civilization. Even though it is a country rich in history, many farmers are going hungry while multinational firms reap the financial benefits. It's likely that the aforementioned problem is at least partially due to inadequate supply chain management. As most people know, agricultural machinery rapidly ages if not maintained. While the government provides farmers with storage facilities, they have no idea whereabouts their crop is due to the present logistics management system. It is also difficult for businesses to keep track of their goods during transportation without resorting to guesswork. That's why it's important for farmers and policymakers to keep an eye on the condition of their goods and conduct regular audits of the production process. In this study, we propose using Blockchain technology to facilitate more dialogue between producers and consumers by facilitating complete product transparency. Farmers and government workers that take part in the transit will be able to see all the procedure's specifications that are stored in the blockchain. Moreover, documents kept in perpetuity may remain accessible for as long as needed.***



***Keywords*—Supply chain management, Smart contract, Blockchain, Agriculture, Goods, Farmer.**


## I. INTRODUCTION

Agricultural production is the backbone of the Indian economy. Agricultural sector contributes roughly 17.5% of India's GDP. Unfortunately, the present crisis for Indian farmers is catastrophic. Roughly 82% of farmers who tend just under 2.5 hectares of land are classified as small-scale farmers. The crops farmers produce on their farm are also a major source of revenue for them.

Today's irregular seasons can be attributed to adverse climatic circumstances. Such that, either one severe flood wipes out the crops, or there is no rain, resulting in a drought. Due to the inability to store the valuable but volatile items for an extended period, farmers sometimes do not receive fair compensation for their output. Most rural residents were denied of farmers. Only a small number of options exist to reduce the financial burden of growing and storing crops for farmers. Farmers might potentially boost their income by stockpiling goods and selling them during popular seasons. Due to a lack of available storage space, only a small number of farmers were compelled to make the trek from their farms to the facility. In order to maximise their earnings, farmers were forced to send their goods to distant marketplaces. Local farmers had much less time for distribution and advertising as a result of the increased time required for farming. Farmers whose commodities are stored in government warehouses have no means of knowing wheretheir products are at any one time. Many farmers are likelyto be easily deceived by agents into paying less than the fair price for their commodities due to their lack of awareness of the present status of their items and the market scenario. Therefore, it is critical to have a system that helps farmers track where their goods are and what condition they are in. Internet of Things is being used more and more in farming, but as the number of operating systems used in IoT expands, the resulting issues with IoT hierarchy become more apparent.

A larger financial outlay is needed in rural regions to bring the form up to date with IoT. Therefore, it is important to make the most of the time and energy spent helping farmers improve their situation. It is more important to prevent middlemen from modifying crucial information about agricultural products including price, supply, and demand between producers and consumers.It is possible to do so by integrating the Internet of Things with the cutting edge blockchain technology. This study proposes a system based on Blockchain to keep records on the many initiatives available to farmers.

The Blockchain network is the foundation of this technological advances. Well all operations between farmers, dealers, and clients may be recorded in a shared ledger using this decentralised method of data handling..

All the nodes and participants in Blockchain create events known as transactions. Each

transaction must be confirmed by all parties before it can be included in a block. In order to establish a connection between two blocks in the system, the hash function of the prior block must be included in the new block. The immutability of blockchain storage is a major benefit for agricultural data. A new transaction must be generated if any information in the block has to be updated, including the price of agricultural products. In order for the buyer and the seller to see the revised quote, the block is updatedwith the new event.

Only when all application-specified requirements aremet can a Blockchain transaction be produced. Ethereum Virtual Machine processes all Ethereum transactions. The EVM keeps track of all currency and cryptography protocols. That ensures blockchain always has a known and consistent state. Everything agreed upon is written into code and stored in the smart contract. Every line, EVM runs this code. Referencing the agreement's program begins the transaction process. Prerequisite statements serve as all agreements to be signed. Once the conditions are met, the subsequent action will be carried out. After a successfultransaction, the data must be appended to a block. Thisactivity was caused by miners. To get a transaction included in a block, more than one miner must compete with each other. The successful miner does a few things, including adding the transaction to the block & alerting other miners.If the job is approved, the transaction is included in the block. Proof of Work is the name for this position (PoW). Therefore, the safety of the transaction improves even as size of Blockchain grows. Using blockchain and IoT in agriculture has several benefits, which are confirmed in this research. Further, it details the steps that must be done to implement this cutting-edge technology in time-honored, life-sustaining industries like farming. The paper will bestructured as follows: Past efforts on SCM are discussed in the second section, while the system design and itsdeployment are covered in Section 3.

## II. EXISTING SYSTEM

Commodities are managed from their initial manufacture to their ultimate destination in a method known as Supply Chain Management. Both product quality and value must be taken into account by SCM. Each of these factors are significant in agricultural applications since the price of agricultural products is directly related to their quality. For the SCM to be effective, all of its parts must work together smoothly. The challenges encountered by India's agricultural industry inspired the country to adopt SCM practices. The predominance of small- and marginal-scale farmers, disjointed distribution networks, a lack of cost advantages, a mediocre level of production and value addition, an inadequate marketing network, etc. are all elements that contribute to the aforementioned problems [2,3]. The Indian a farmers want a place to keep their goods, where they can check on them at any time, and where they can also sell for a

Benefit[4,5].

SCM was first used for agricultural businesses a long time ago. To begin with, SCM is thought of as the communication between warehouses and businesses. In subsequent stages of the SCM process, it is built to serve as the link between of different components [6]. Because of the time and temperature sensitivities of agricultural products, each link in the distribution chain must be carefully monitored. It should be clear from the foregoing that SCM plays a crucial role in the agricultural sector [7]. However, India's agricultural supply network falls short of expectations. One issue that has yet to be resolved is that farmers cannot check the progress of their compensation claims or see where their processes stand at any given time. Several approaches are discussed in the literature with the aim of resolving the shortcoming. Applying Blockchain technology for SCM process monitoring is such answer [8,9,10].

An in-depth analysis [11] of the ways in which Blockchain may be used in farming has been completed. The research targets the regions [12] in between two. Furthermore discussed [13] was the utilization of Blockchain in agricultural tracking systems. This article begins with some fundamental terminology before moving on to draw parallels between the Blockchain and a system of

traceability.In this essay, we analyse the pros [14] and cons [15] of using Blockchain technology to the agriculture industry. The rising need for food forces scientists to find ways to use their many technologies in concert. Integrating Blockchain and IoT is recommended as a viable solution [16,17] for product traceability.

## II.LITERATURE REVIEW

To that purpose, we evaluate and highlight published studies on blockchain promises for food and agriculture supply chains.

One such research is "Block chain technology and agriculture industrial goods tracking: study advancements and future problems" [1] by Giovannii Mirabeli. For this research, the authors gathered and examined the most relevant contributions to the written literature on the topic of block chain's usage in agriculture, with a focus ondietary accountability issues. Hormones and other compounds used often in farming aid in accelerating development and, therefore, increase field productivity. Specimen and rice are sometimes fortified with recycled mineral oil. These methods, taken together, underminethe economic value of agricultural products while also endangering public health. With only an eye on nutritional transparency, this research intends to undertake a research study of blockchain statements in agricultural stream chains. This lesson delves at the connection between blockchain technology and food tracing infrastructure.

In their work, Caro et al. [2] describe "AgriBlockIoT- A blockchain-based traceable system incorporating data collected from IoT devices throughout the value chain." Since need to divided, they built a use case for pursuing yieldby connecting Ether & Hyperledger's processes.

Smart contracts & DLT are discussed in detail in a study titled "Emerging Possibilities for the Utilization of Blockchain in the Farmer Industry" [3] by Mischa Tripoli et al. Dramatists are aware of the considerable potential DLTs offer for achieving long-term evolution goals, but they also realise the practical and executional barriers that prevent their full realisation.

In their paper "A Ledger System to Enhance Consistency and Stability in the Food Logistics Chain," Gavina Baralla et al. In Sardinia, they developed a system for regulating the flow of food, complete with a smart contract and blockchain built on the Ethereum platform. In order to promote responsible tourism and ensure the continued viability of Sardinia's indigenous crops, Barala. highlight the benefits of adopting this strategy.

Review of Yunchuann Li et al"Food .'s Tracking in theSupply Chain" [4]. This paper's dramatist has an unusual profession including FTSs; traceability methods may be linked with nourishment logistics; and competitor collaboration is boosted. The introduction of reliable and impactful tracking solutions requires substantial effort. Humanity, government, and science must give FTSs more credit than they often get. The focus of future study should be on figuring out how to utilise big data effectively innutritional tracking schemes and improving the efficiency of traceable and transportation processes.

## IV.PROPOSED SYSTEM

Numerous measures [18] were introduced by the federal gov't's agriculture department, cooperative, and farmers' wellbeing. It's a major unknown, however, whether the intended recipient really receives these advantages. Agriculture is dependent on assistance from state officials along the whole distribution network. A number of authorities have been put in place at different tiers to keep an eye on things, but this is still an issue.

A solution based on Blockchain is offered in this study for inventory management. Figure 1 depicts the suggested model's process.

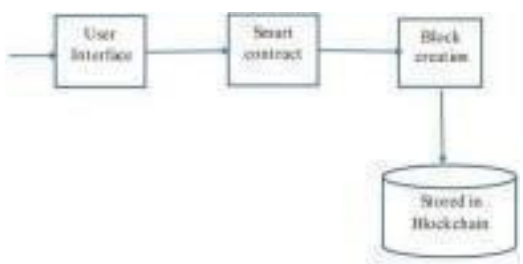


Fig.1. Proposed Method

### *A. Farm-based Blockchain methodology -*

Quantities, status of the merchandise (colour, size, organic/manure free/natural, humidity, cultivation period and pricing), all recorded in the ledger anytime agricultural products leave a landowner's location for distribution. A questionnaire is used to gather the aforementioned data about the merchandise. The parameters of the smart contract areapplied to the data collected via this page. Inspections of the items' condition and quality are normal protocol prior to shipping. Aim of this inspection is to make sure that just the right items are being sent. The consensus mechanism in Blockchain technology is responsible for doing this authentication.

All of the rules and regulations will be written into a computer programme, which is what a smart contract is. Fresh transactions are generated when the smart contract confirms the accuracy of the parameters collected via the user interface. The produced transaction is included in a block through mining after a duration of time. Because of this, the product data is now recorded in a distributed, immutable database called Blockchain.

Fig 2. Blockchain technology's potential in the agricultural sector's many subsectors.

### *B. IoT agent's Blockchain process -*

The state of the contents is often determined by environmental conditions - humidity, temperature and the availability of certain substances. That's why we included a thermostat, moisture, and gaseous sensor in the suggested scheme. It is possible for fungus to develop on the surface of vegetables and fruits if they areexposed to adverse temperatures. The gas sensor helps pinpoint the source of the gas produced by the mould. Measure the quality of agricultural products throughout the supply chain process using data gathered from sensors installed in warehouses and delivery vehicles and recorded in a distributed ledger. This ensures that allparties involved in the distribution of goods, from growers to consumers, have access to up-to date information.

*C. Software Process -*

The built-in software compares the price recorded in the blockchain with the current market price when any latter fluctuates. If necessary, this software agent willadditionally add the current market value to the blockchain.

*D. Implementation -*

HTML, CSS & JavaScript are used for the proposal's user interface. This application is used by the farmer to register the specifics of the commodities on the blockchain.

The Internet of Things sensors installed in the troop carrier verify the transactions that assist to record theitems' data. Solidity is used to create the smart contract integral to this solution.

The necessary verification requirements are stored in the contract. As an illustration, if the smart contract specifies that the items' internal humidity must be kept at precisely 3 degrees Centigrade, it is the contract's duty to ensure that this need is met. A new transaction will be made when the supplied values have been validated.

The product's position, including amount sold, ROI, and profit, must be recorded in the ledger each time a customer or intermediary vendor makes a purchase. The farmer benefits from this since it illuminates the market's current state and the value of his products. Meanwhile, the payment may be sent to the farmer's bank from customers' account, and all these transactions can indeed be stored on the blockchain.

## IV. RESULTS AND DISCUSSION

After making an attempt to convince the farmers, a representative of 3 sections was collected to test the practicality of execution. Recording the costs and profits of the crops previously grown was a priority RoI. Additionally, the identical particulars were recorded when Blockchain & IOT were applied to their respective domains. The Analysis of variance (anova) was used to look at all of these specifics. In Table 1, we see a breakdown of the various crops, along with the associated costs and returns.

In Fig 3, we can see the ROI that can be achieved by using Blockchain, IOT or both to track the quality of farm exports and take appropriate action to extend their shelf life. It has been seen that keeping an eye on the health of agricultural goods via the Internet of Things helps to ensure that they are in prime shape when they reach the hands of consumers. The result is a dramatic increase in return on investment.

However, it is not certain that the farmers would get this benefit, since it might be obtained via intermediary firms who purchase the commodities from farmers & sell them according to the interests of the farmers. Using blockchain as well as the Internet of Things together, trust amongst consumers and farmers may be maintained at a high degree. The farmers stand to gain significantly from this.

Table1 : - Specific details about investments and their returns

| S.No | Crops | Investment in rupees | Area(hc) | ROI - Conventional way in rs | ROI- After IOT in monitoring in rs | ROI- After IOT in transportation | ROI- After Blockchain | ROI- After Blockchain and IOT |
|---|---|---|---|---|---|---|---|---|
| 1 | Tomatoes | 55476 | 1 | 16614 | 29592 | 35093 | 41226 | 50750 |
| 2 | Lady's Finger | 27070 | 1 | 6502 | 8012 | 9630 | 10220 | 12038 |
| 3 | [illegible] | [illegible] | 1 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

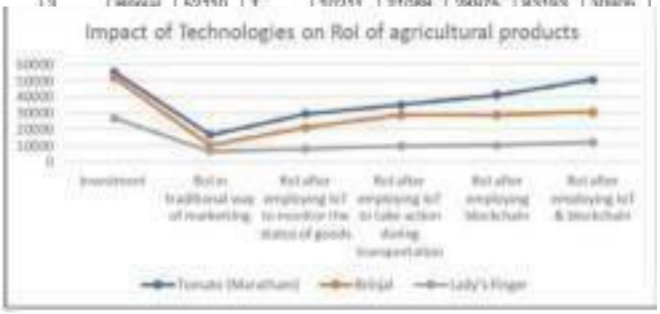


Fig.3.Modern technology's effect on the return on investment of agricultural products

## V. CONCLUSIONS

In this paper, we propose a Blockchain-based system for monitoring food and supplies. All SCM participants, including middlemen, can know where items are and when they will be ready for delivery owing to the real- time status updates stored in blockchain. Data once placed in the Blockchain cannot be changed by anyone at all since the records kept there are irreversible. Each andevery member of SCM, however, has access to the data. This method has the potential to be used with a wide range of approaches in the long term. Using Blockchain and IOT technology requires an upfront financial commitment. Farmers themselves are most suited to make this happen, but if they don't, the authorities may step in toforce the issue.

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