



**G.K.M COLLEGE OF ENGINEERING AND TECHNOLOGY**

**CHENNAI-600063**

# AGRICULTURE DOCS CHAIN IN BLOCKCHAIN

**PROJECT REPORT**

**Submitted by**

**TEAM ID: NM2023TMID00542**

**TEAM MEMBERS**

**ABINASH S.J - 410820106001**

**ABY ANTONY REX - 410820106002**

**SIVARAMAN.V - 410820106301**

**CHANDRU M.K - 410820121009**

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## 1.INTRODUCTION

### 1.1 PROJECT OVERVIEW

The "Agriculture Documentation and Reporting System" is a project designed to address the specific needs and challenges within the agricultural industry. It aims to provide a comprehensive solution for efficient documentation and reporting, catering to the diverse stakeholders in this sector, including farmers and government agencies. This system will feature a range of functionalities that streamline data management and reporting, ultimately supporting the project's key objectives. We'll deploy a carefully selected technology stack to build the system, considering both software and hardware components. The project will follow a structured timeline with clear milestones. Additionally, a budget and resource allocation plan is in place to ensure the successful implementation of the system. We've

identified potential risks and devised mitigation strategies, and the project has sustainability and scalability plans to support its long-term viability and adaptability. Evaluation and monitoring mechanisms will measure the system's impact and success. In conclusion, this project holds immense potential for improving efficiency in agriculture, benefitting various stakeholders and addressing critical industry needs. For further information or collaboration, please feel free to reach out to the project team using the provided contact information.

## 1.2 PURPOSE:

The purpose of implementing a Agriculture documents and chains for reporting serve a multifaceted purpose within the realm of agricultural operations and research. These documents are the backbone of organized farming, facilitating the meticulous record-keeping of crucial data such as planting schedules, crop varieties, weather conditions, and harvest yields. Moreover, they are vital tools for ensuring compliance with the intricate web of regulations pertaining to environmental, health, and safety standards, thus ensuring smooth operations and averting complications during inspections or audits. Beyond mere record-keeping, these documents have a more profound impact on the agricultural landscape, providing the raw data required for in-depth research and analysis. Agricultural researchers and agronomists rely on this wealth of information to discern trends, assess the efficacy of various farming practices, and chart a course toward enhanced crop yields and sustainability. The data housed within these reports is instrumental in guiding decision-making processes for farmers and agricultural managers, enabling them to determine optimal planting times, irrigation schedules, and fertilizer application based on historical trends and prevailing conditions. Furthermore, these records offer valuable insights for financial management, allowing for budgeting, cost-tracking, and profitability assessments for different crops or livestock. They also play a critical

role in the realm of traceability, acting as a lifeline in the event of a product recall or quality issue by swiftly tracing the product's origin and expediting resolution. Moreover, agriculture documents are central to the sustainability and certification efforts of many farms, substantiating adherence to stringent guidelines and standards. These documents also lend themselves to a comprehensive performance evaluation, providing a basis for assessing the success of various practices, crops, or livestock and guiding future strategies for improvement. Lastly, they contribute to knowledge transfer within the agricultural community, fostering a culture of shared experience and insights among farmers and stakeholders, thus fortifying the sector's resilience and capacity for growth.

## 2.LITERATURE SURWAY:

### 2.1 EXISTING PROBLEM:

Agriculture faces several challenges when it comes to managing document chains for reporting. One significant issue is the scattered nature of farming data, which comes from various sources in different formats, making it difficult to compile clear and cohesive reports. Manual data entry adds to the problem, as it's error-prone and time-consuming. Standardizing how data is recorded and reported is often lacking, creating confusion and hindering data analysis.

Data security is a pressing concern, as keeping sensitive information safe while allowing authorized access is crucial. Combining data from different sources, like weather forecasts and crop reports, presents integration challenges. Delays in reporting can impede swift decision-making, and adhering to government rules and regulations for reporting can be complex.

Moreover, many farms struggle with data analysis and ensuring data quality control. Sharing data with stakeholders, such as suppliers or government agencies, is not always straightforward. To address these

issues, the agriculture industry is exploring new technologies like farm management software and sensors, along with industry standards, to simplify and improve the accuracy of reporting in agriculture.

## 2.2 REFERENCE:

Certainly, here are a few more references and sources related to agricultural blockchain:

1. *Agricultural Blockchain Use Cases:* Explore articles or reports that discuss real-world use cases of blockchain in agriculture. Look for examples of how it has been used to track the origin of products, reduce fraud, and enhance transparency in the supply chain.

2. *Blockchain in Crop Traceability:* Investigate how blockchain is being utilized for crop traceability. References in this context may include systems that track the journey of crops from the farm to the consumer, ensuring quality and safety.

3. *Livestock Tracking with Blockchain:* Check for information on how blockchain technology is employed to trace the origin and health of livestock in the agriculture industry.

4. *Blockchain and Smart Contracts in Farming:* Search for references about how blockchain, combined with smart contracts, is revolutionizing farming practices, enabling automated transactions and enhancing trust among stakeholders.

5. *Supply Chain Sustainability:* Some references may focus on how blockchain technology is being leveraged to promote sustainability in agriculture by monitoring and reducing environmental impact.

6.Walmart's Use of Blockchain:* Walmart has been using blockchain technology to improve the traceability of food products. You can find references and articles on how they have implemented blockchain in their supply chain for food safety.

7. *IBM Food Trust:* IBM has developed the Food Trust platform, which is a blockchain-based system designed to enhance transparency in the food supply chain. You can find references about this platform and its applications in agriculture.

8. *Government Initiatives:* Some governments and agricultural organizations have been exploring the use of blockchain for agricultural purposes. You might find references to pilot projects and initiatives that promote blockchain technology in agriculture.

9. *Research Papers:* There are academic research papers and studies that delve into the potential and challenges of blockchain in agriculture. You can search for these to find in-depth references.

10. *Case Studies:* Various companies and startups have implemented blockchain solutions in agriculture. You can look for case studies and references on how these solutions have impacted the industry.

### 2.3 PROBLEM STATEMENT DEFINITION:

Revised Problem Statement for Agriculture Documentation Chains Report:

Title: "Enhancing Agricultural Documentation Chains for Efficiency and Transparency"

Introduction:

Agriculture is a critical sector that sustains global food supply and economic stability. Efficient documentation and record-keeping in agriculture are essential for various stakeholders, including farmers, government agencies, financial institutions, and supply chain participants. However, many regions still struggle with outdated or inefficient documentation processes, leading to challenges such as limited access to credit, reduced traceability, and difficulties in compliance and decision-making.

Problem Statement:

The problem at hand is the inefficiency and lack of transparency in agriculture documentation chains, which includes the collection, storage, and dissemination of critical information and records related to agricultural activities. The primary issues that need to be addressed in this report are:

1. **Manual and Paper-based Processes:** Many agricultural documentation processes still heavily rely on manual and paper-based methods, making record-keeping time-consuming, error-prone, and vulnerable to damage or loss.

2. **Limited Data Accessibility:** Accessibility to essential agricultural data is often restricted due to fragmented data sources, poor data management, and inadequate information sharing mechanisms. This hampers data-driven decision-making and transparency.

3. **Data Integrity and Security:** Maintaining data integrity and ensuring data security in agriculture documentation chains is a pressing concern, especially given the potential for fraud, data manipulation, and data breaches.

4. **Inadequate Digital Infrastructure:** In some regions, there is a lack of digital infrastructure, including internet connectivity and hardware, which further complicates the adoption of digital documentation solutions.

5. **Interoperability and Standardization:** Incompatible data formats and a lack of standardized documentation protocols hinder the smooth flow of information between different stakeholders, impeding collaboration and transparency.

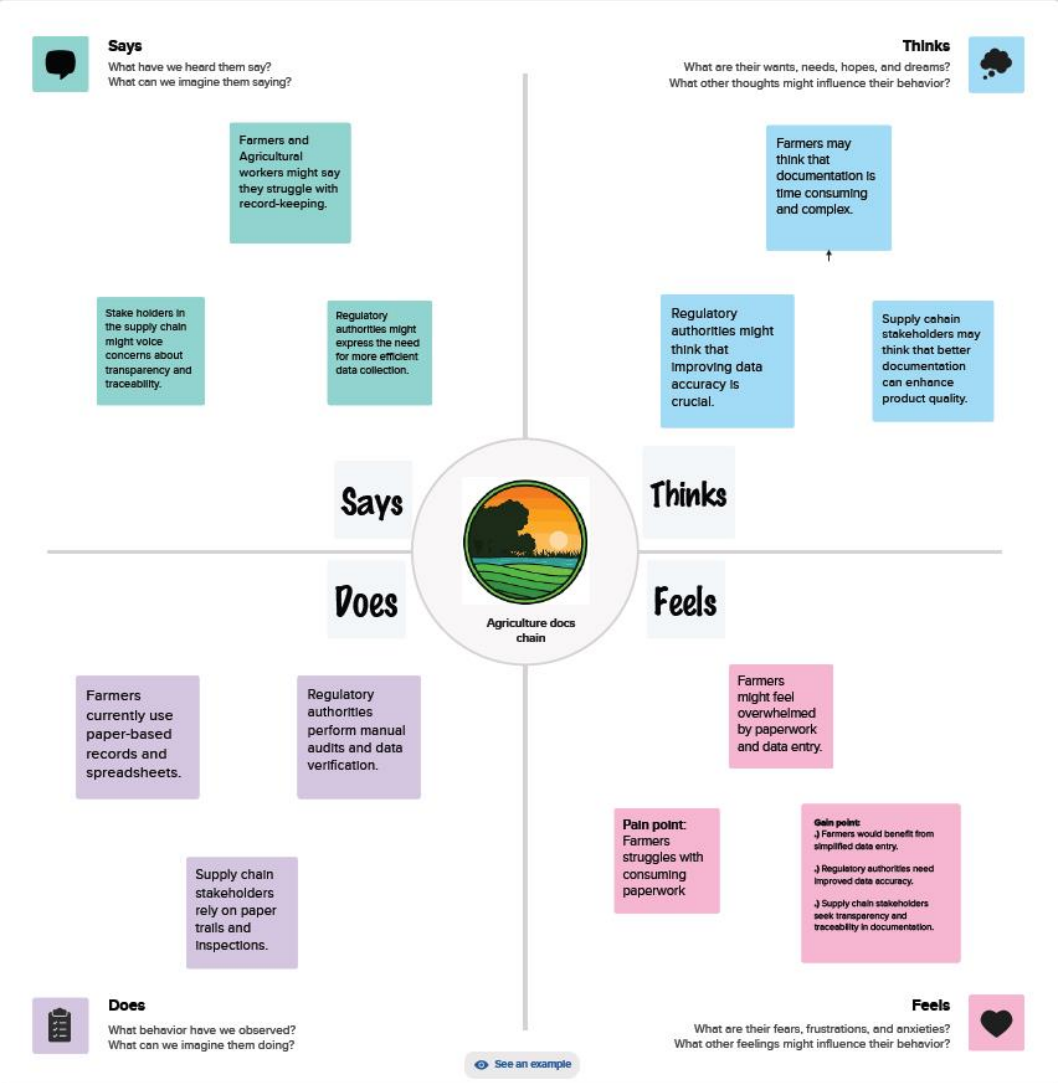
6. **Limited Financial Inclusion:** Inefficient documentation processes reduce access to financial services for small-scale farmers, as financial institutions struggle to assess creditworthiness without reliable data.

7. **Traceability and Compliance:** The inability to track the origin and production history of agricultural products hampers traceability and compliance with quality and safety standards, especially important in global supply chains.

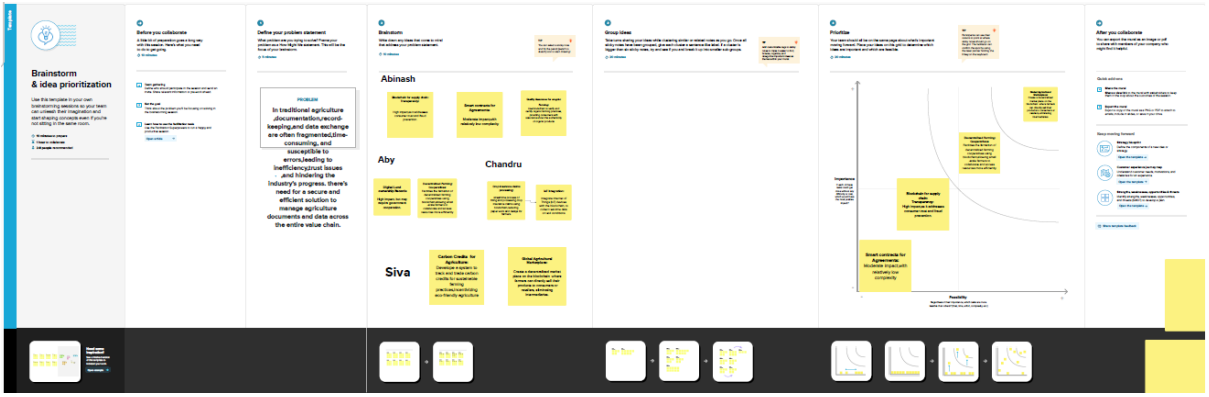
This report aims to explore and propose solutions to address these inefficiencies and lack of transparency in agriculture documentation chains.

## 3. IDEATION &PROPOSED SOLUTION :

### 3.1 EMPATHY MAP CANVAS:



## 3.2 BRAIN STORMING:




## 4.REQUIREMENT ANALYSIS

### 4.1 FUNCTIONAL REQUIREMENT

Functional requirements for an agriculture blockchain system, often referred to as "agriculture dock chain," can vary based on specific goals and use cases. Here are some essential functional requirements:

1. *User Registration and Authentication*: Users, including farmers, regulators, and consumers, should be able to register, log in, and authenticate their identity securely.

2. *Supply Chain Tracking*: Implement a feature to track the entire supply chain, including planting, harvesting, transportation, and distribution of agricultural products.

3. *Smart Contracts*: Create and manage smart contracts for various transactions, such as purchase agreements, payments, and quality certifications.

4. *Data Entry and Verification*: Enable participants to input data, which should undergo verification processes to ensure accuracy and integrity.

5. *Product Traceability*: Allow users to trace the origin of agricultural products, providing information on the farm, production methods, and quality standards.

6. *Quality Control and Certification*: Incorporate quality control mechanisms and certifications to ensure that products meet industry and safety standards.

7. *Payment and Settlement*: Implement a secure payment system that allows for seamless and automated payments based on smart contracts and delivery confirmations.

8. *IoT Integration*: Integrate with IoT devices to collect real-time data on factors like soil quality, weather conditions, and inventory levels.

9. *Regulatory Compliance*: Ensure the system complies with relevant agricultural regulations and standards, with features for regulatory reporting and auditing.

10. *Data Analytics*: Provide tools for data analysis, allowing farmers to make informed decisions and regulators to monitor trends in the agricultural sector.

11. *User Notifications*: Notify users of important events, such as the completion of a contract, quality issues, or payment transactions.

12. *Marketplace*: If applicable, create a marketplace for buying and selling agricultural products directly through the platform.

13. *Mobile Access*: Develop a mobile-friendly interface or app for users who need to access the system on the go.

14. *Privacy and Security*: Ensure robust security measures to protect user data and transactions, and give users control over their personal information.

These functional requirements should serve as a foundation for designing and developing an effective agriculture blockchain solution. Depending on your specific project, you may need to further customize these requirements.

**4.2 NON FUNCTIONAL REQUIREMENT :**

Non-functional requirements for an agriculture blockchain system, often referred to as "agriculture dock chain," are crucial for ensuring the system's overall performance, reliability, and usability. Here are some essential non-functional requirements:

1. *Performance*:

- *Response Time*: Define acceptable response times for various system operations, such as transaction processing and data retrieval.

- *Scalability*: Ensure that the system can handle an increasing number of users and data without significant degradation in performance.

2. *Reliability*:

- *Availability*: Define the minimum acceptable uptime and availability percentage for the system.

3. *Security*:

- *Data Encryption*: Specify encryption standards to protect data at rest and during transmission.

- *Access Control*: Define user roles and permissions to restrict access to sensitive data and functionalities.

- *Audit Trail*: Implement auditing and logging mechanisms to track user actions and system events.

4. *Compliance*:

*Regulatory Compliance*: Ensure the system complies with relevant agricultural and data privacy regulations, such as GDPR or HIPAA, if applicable.

5. *Usability*:

- *User Interface Design*: Ensure an intuitive and user-friendly interface for users across various levels of technical expertise.

- *Accessibility*: Make the system accessible to users with disabilities, complying with accessibility standards.

6. *Interoperability*:

- *Integration Capabilities*: Define the ability of the system to interact with external systems, such as legacy databases or other blockchain networks.

7. *Data Management*:

- *Data Retention*: Specify data retention policies, including archiving and deletion of data, for compliance and performance reasons.

- *Data Backup and Recovery*: Implement regular data backup procedures and disaster recovery plans.

8. *Scalability and Resource Utilization*: - *Resource Consumption*: Define the acceptable consumption of system resources, including CPU, memory, and storage.

- *Horizontal and Vertical Scaling*: Detail how the system can scale both horizontally (adding more servers) and vertically (increasing resources on existing servers).

9. *Testing and Quality Assurance*:

- *Testing Procedures*: Specify testing requirements, such as unit testing, integration testing, and load testing.

- *Quality Standards*: Adhere to quality assurance standards like ISO 9001, if applicable.

10. *Documentation*:

- *User Documentation*: Provide comprehensive user guides and documentation for system users.

- *Technical Documentation*: Offer documentation for developers, including API specifications and system architecture.

11. *Environmental Considerations*:

- *Energy Efficiency*: If applicable, design the system with energy-efficient hardware and software components.

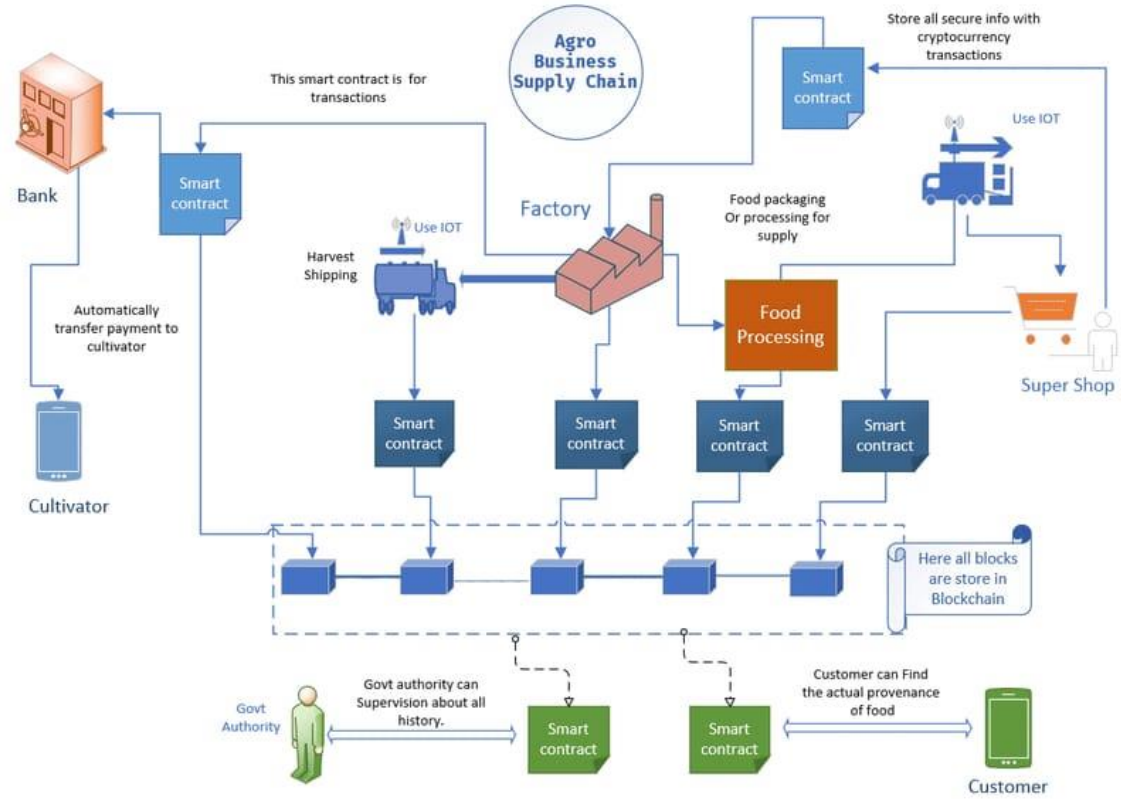
12. *Cost and Budget Constraints*:

- *Budget Limitations*: Define budget constraints for development, maintenance, and operation.

These non-functional requirements are essential for ensuring that the agriculture dock chain system operates effectively and meets the expectations of its users while maintaining performance, security, and compliance standards.

## 5 PROJECT DESIGN:

### 5.1 DATA FLOW DIAGRAM:




Creating a Data Flow Diagram (DFD) for an agriculture dock chain project involves visualizing the flow of data within the system. Here's a simplified example of a DFD for such a project:

Level 0 DFD (Context Diagram):

- The system is represented as a single process box.

- External entities are connected to the system, including farmers, suppliers, and consumers.

- Arrows represent data flows between the system and external entities.

Level 1 DFD:

- Decompose the system into subprocesses. In this case, you might have subprocesses like "Harvesting," "Storage," "Distribution," and "Consumer Sales."

- Identify data stores such as "Crop Inventory" and "Customer Orders."

- Show data flows between these subprocesses and data stores.

Level 2 DFD:

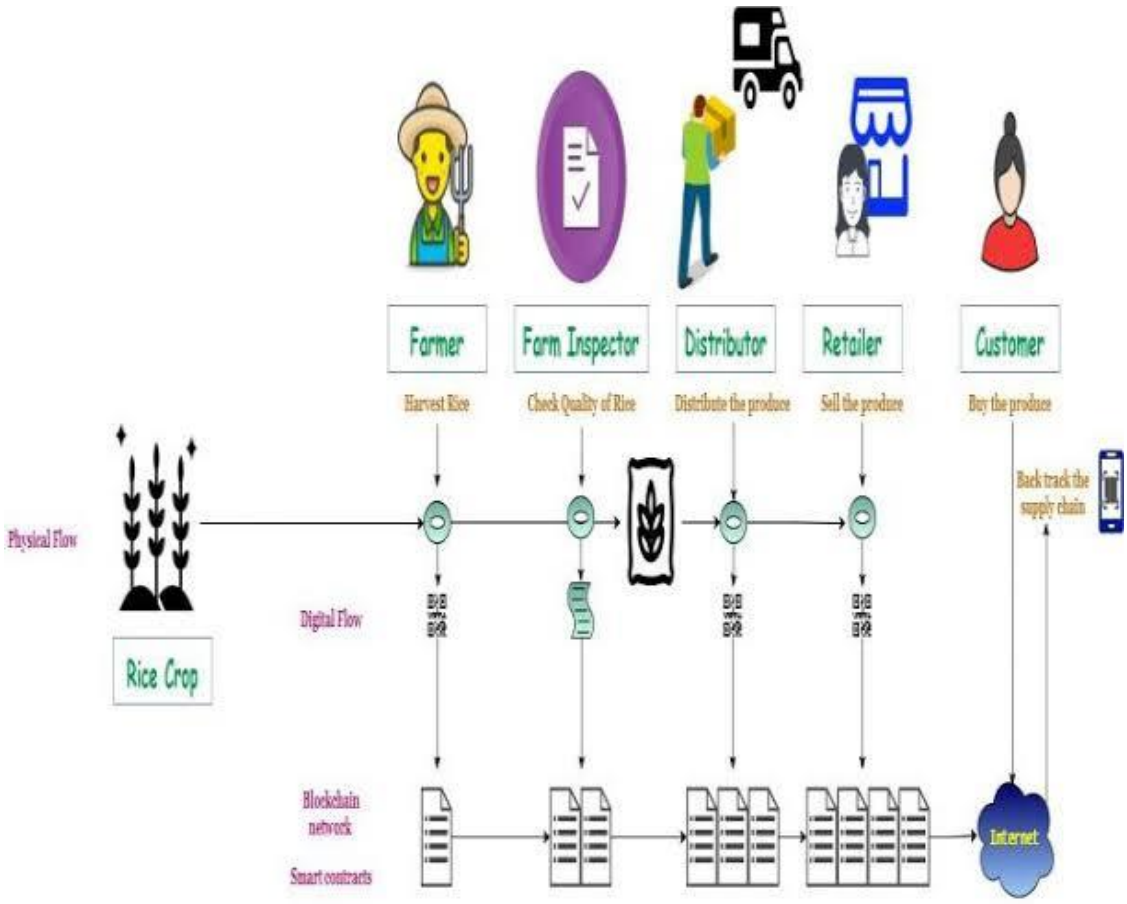
- Further decompose each subprocess into more detailed processes. For example, within "Harvesting," you could have sub-processes like "Crop Selection," "Harvesting Process," and "Quality Control."

- Identify specific data flows within these subprocesses.

You can use standard DFD symbols, such as rectangles for processes, arrows for data flows, and data stores for data repositories. Make sure to label each component appropriately.

This is a basic outline for your agriculture dock chain DFD. The actual structure and components will depend on the specific requirements and complexity of your project. Be sure to involve stakeholders to gather the necessary information for a more detailed DFD.

**5.2 SOLUTION ARCHITECTURE:**




A solution architecture for an agriculture document chain typically involves designing a system to manage and track various documents and data related to agriculture. This might include:

1. *Data Sources*: Identify the sources of agriculture-related data, such as crop information, soil data, weather data, and regulatory documents.

2. *Data Collection*: Define how data will be collected, whether through sensors, manual input, or other means.

3. *Data Storage*: Determine where and how data will be stored, considering scalability and data security.

4. *Data Processing*: Plan for data processing, which could involve data normalization, validation, and transformation.

5. *Blockchain or Distributed Ledger*: Consider implementing a blockchain or distributed ledger for secure and transparent document management.

6. *Smart Contracts*: Utilize smart contracts to automate and enforce agreements related to agriculture, such as supply chain contracts or payment agreements.

7. *User Interfaces*: Design user interfaces for various stakeholders to interact with the system, such as farmers, regulators, and buyers.

8. *Security*: Ensure robust security measures to protect sensitive agriculture data and maintain the integrity of the document chain.

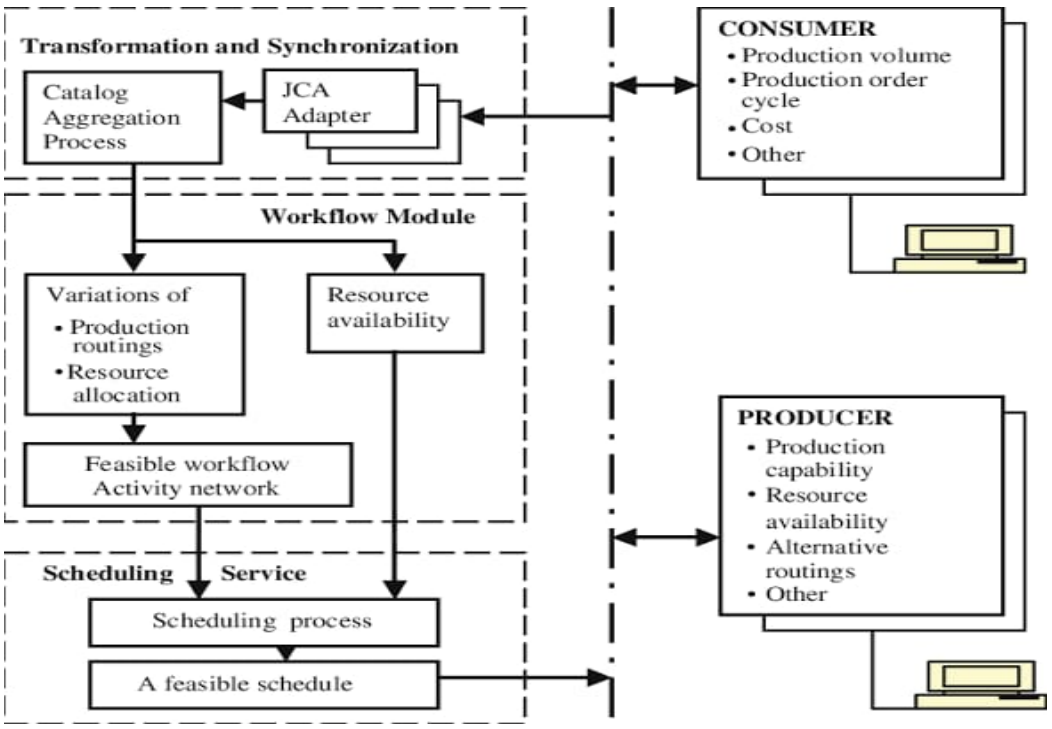
9. *Integration*: Integrate with external systems, such as government databases or marketplaces.

10. *Analytics*: Implement data analytics and reporting to derive insights from the collected data.

The specific architecture will depend on the requirements and goals of the agriculture document chain system. It's important to engage with stakeholders to gather their needs and consider the available technologies and best practices for implementing such a system.

# 6 PROJECT PLANNING &SCHEDULING:

## 6.1 TECHANICAL ARCHITCHTURE:




# 7. CODING &SOLUTONING:

## 7.1 FEATURES 1:

connector.js | agricultureOnBlockchain.sol

4_Problem_Statement_14_Agriculture > Agriculture > agricultureOnBlockchain.sol

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;

contract AgricultureRegistry {
    struct foodProduct {
        string name;
        string description;
        uint256 quantity;
        address owner;
    }

    mapping(uint256 => foodProduct) public products;
    uint256 public productCount;

    event ProductAdded(uint256 productId, string name, string description, uint256 quantity, address owner
    event ProductUpdated(uint256 productId, string name, string description, uint256 quantity);

    modifier onlyOwner(uint256 _productId) {
        require(products[_productId].owner == msg.sender, "Only the owner can perform this action");
        _;
    }

    function addProduct(uint256 ProductId, string memory _name, string memory _description, uint256 _quant

        products[ProductId] = foodProduct(_name, _description, _quantity, msg.sender);
        productCount++;
        emit ProductAdded(productCount, _name, _description, _quantity, msg.sender);
    }

```

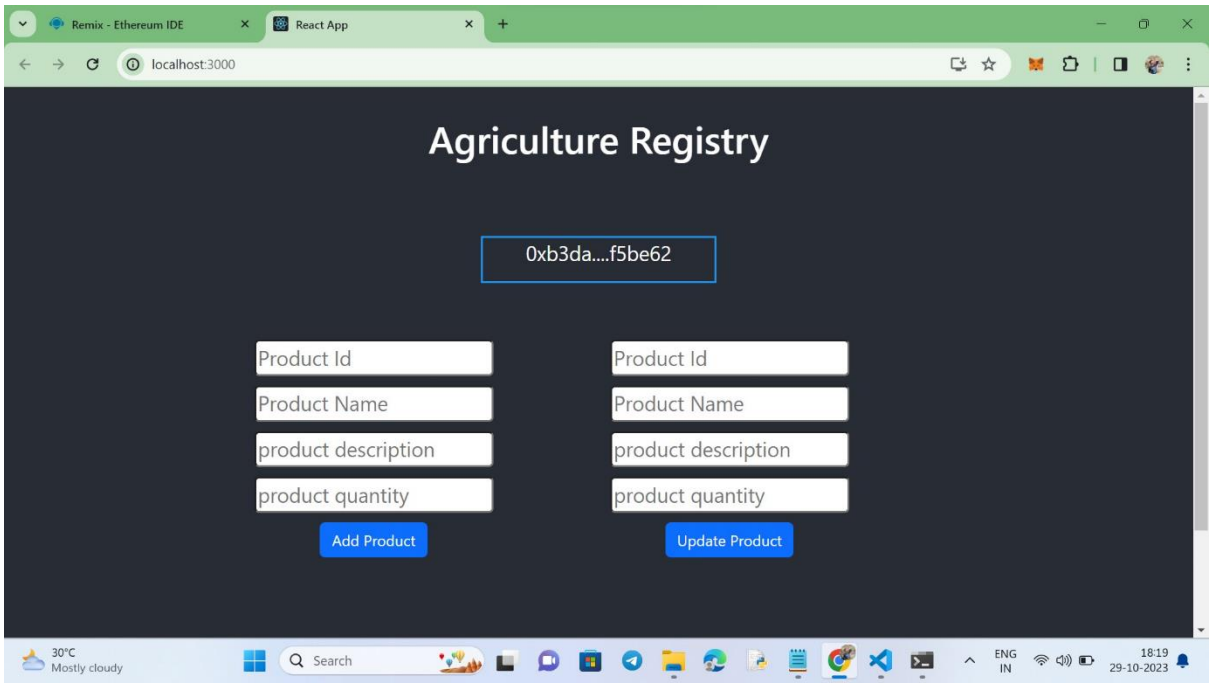
```
14_Problem_Statement_14_Agriculture > Agriculture > agricultureOnBlockchain.sol
25          products[ProductId] = foodProduct(_name, _description, _quantity, msg.sender);
26          productCount++;
27          emit ProductAdded(productCount, _name, _description, _quantity, msg.sender);
28      }
29
30      function updateProduct(uint256 _productId, string memory _name, string memory _description, uint256 _q
31          foodProduct storage product = products[_productId];
32          product.name = _name;
33          product.description = _description;
34          product.quantity = _quantity;
35          emit ProductUpdated(_productId, _name, _description, _quantity);
36      }
37
38      function getProductDetails(uint256 _productId) external view returns (string memory name, string memor
39          foodProduct memory product = products[_productId];
40          return (product.name, product.description, product.quantity, product.owner);
41      }
42  }
```

# 8. PERFORMANCE TESTING:

## 8.1PERFORMANCE METRICS:

# 9 RESULTS:

## 9.1 OUTPUT SCREENSHOTS:



## 10 ADVANTAGES&DISADVANTAGES:

### ADVANTAGES:

Implementing an agriculture document chain, often based on blockchain or distributed ledger technology, offers several advantages:

1. *Transparency*: All participants in the agricultural ecosystem can access a shared ledger, which ensures transparency and trust. Farmers, suppliers, regulators, and consumers can verify information, reducing fraud and misinformation.

2. *Immutable Records*: Data on a blockchain is tamper-resistant. Once information is recorded, it cannot be easily altered or deleted. This integrity is crucial for maintaining accurate and reliable records.

3. *Security*: Blockchain technology uses advanced encryption methods to protect data. This ensures that sensitive agricultural data, such as crop yields, quality standards, and financial transactions, are secure.

4. *Traceability*: Agriculture document chains enable the tracking of products throughout the supply chain. This is particularly valuable for food safety and quality control, allowing for quick recalls and source identification in case of contamination or other issues.

5. *Efficiency*: Smart contracts can automate and streamline various processes within agriculture, such as payment settlements, compliance with regulations, and even resource allocation. This reduces paperwork and manual tasks.

6. *Reduced Costs*: By eliminating intermediaries and automating processes, agriculture document chains can reduce transaction costs. This is beneficial for both large agribusinesses and small-scale farmers.

7. *Improved Compliance*: Blockchain can be used to ensure that all participants adhere to relevant regulations and standards. This is especially valuable in agriculture, where compliance with safety and

environmental regulations is critical.

8. *Decentralization*: Traditional agriculture systems often rely on centralized authorities. Blockchain allows for more decentralized control, reducing the power of single entities and promoting a fairer ecosystem.

9. *Global Access*: Agriculture document chains can be accessed globally, which is useful for international trade and cooperation. Farmers in different parts of the world can interact and share information seamlessly.

10. *Market Access*: Small farmers, who might have been excluded from larger markets, can gain access to a broader customer base through blockchain-based platforms.

Implementing an agriculture document chain can lead to increased efficiency, trust, and security in the agricultural sector, benefiting everyone from farmers to consumers.

**DISADVANTAGES:**

If you're referring to a digital or paper-based documentation chain within the agriculture industry, there can be some disadvantages, such as:

1. *Complexity and Overhead*: Managing and maintaining an extensive chain of documents in agriculture can be complex and resource-intensive.

2. *Data Entry Errors*: Human errors in data entry can lead to inaccuracies in records, which could impact decision-making and compliance.

3. *Limited Accessibility*: Paper-based documentation can be less accessible to all stakeholders, especially in remote or rural areas with limited connectivity.

4. *Data Security*: Protecting sensitive agricultural data from breaches or unauthorized access can be a challenge, especially with digital documentation.

5. *Regulatory Compliance*: Keeping up with changing agricultural regulations and ensuring that documents align with these regulations can be burdensome.

6. *Environmental Impact*: Excessive paper documentation can have negative environmental impacts due to the use of resources like trees and the generation of waste.

7. *Costs*: Managing documentation chains can incur significant costs, from storage to personnel for data entry and management.

It's worth noting that many of these disadvantages can be mitigated or even eliminated with the adoption of modern digital documentation and data management systems tailored for the agriculture sector. These systems can streamline processes, improve data accuracy, enhance security, and reduce the environmental footprint associated with paper-based systems.

**11. CONCLUSION:**

In conclusion, the documentation chain in agriculture has its share of disadvantages, particularly when managed through traditional paper-based methods. These drawbacks include complexity, data entry errors, limited accessibility, data security concerns, challenges with regulatory compliance, environmental impact, and associated costs. However, the adoption of digital documentation systems can alleviate many of these issues, leading to improved efficiency, data accuracy, security, and environmental sustainability within the agriculture industry. It's important for agricultural stakeholders to consider the benefits and drawbacks of their specific documentation practices and explore opportunities for modernization and optimization.

**12. FUTURE SCOPE:**

The future scope of the agriculture documentation chain is promising, with opportunities for innovation and improvement in various areas. Here are some aspects of the future scope for agriculture documentation:

1. *Digital Transformation*: The widespread adoption of digital solutions, including farm management software, IoT (Internet of Things) devices, and data analytics, will continue to transform the way agricultural data is collected, stored, and analyzed.

2. *Blockchain Technology*: Blockchain can enhance the security and transparency of agriculture documentation by creating tamper-proof records, enabling traceability, and improving trust in the supply chain.

3. *Smart Farming*: The integration of sensors, drones, and other smart farming technologies will enable real-time data collection and analysis, revolutionizing how data is documented and used in decision-making.

4. *Data Integration*: Systems that facilitate the integration of data from various sources, such as weather data, soil data, and crop data, will provide a holistic view of agricultural operations, leading to better-informed decisions.

5. *AI and Machine Learning*: These technologies will play a significant role in data analysis, helping farmers predict crop yields, optimize resource allocation, and identify potential issues in real time.

6. *Remote Access and Mobility*: Mobile applications and cloud-based platforms will continue to enable farmers to access and update documentation from anywhere, improving efficiency and reducing manual data entry.

7. *Sustainability and Traceability*: Consumers' increasing demand for transparency in the food supply chain will drive the need for

accurate documentation related to sustainable and ethical farming practices.

The future of agriculture documentation is tied to technological advancements and the industry's increasing focus on sustainability and efficiency. As these trends continue to evolve, the agriculture documentation chain will become more robust and data-driven, enabling better decision-making and improved agricultural practices.

## 13. APPENDIX:

**Source Code GitHub:**

**Project Demo Link:**