AGRICULTURE DOCS CHAIN

CONTENTS

1.INTRODUCTION

1.1 Project Overview

The "Agriculture Docs Chain" project is a revolutionary initiative designed to streamline and enhance the agricultural documentation and tracking processes. This digital platform serves farmers, suppliers, and regulatory bodies, facilitating secure, transparent, and efficient record-keeping. The system offers a user-friendly interface for mobile and web users, enabling quick and secure registration and login. Once authenticated, users can access personalized dashboards to track their agricultural operations and interact with the issue tracker. Notably, administrators maintain robust user access control and security measures, fostering data integrity and preventing fraudulent activities. Emphasizing security, accessibility, and usability, this project aims to improve the user experience and build trust within the agricultural community. It unifies the entire agricultural ecosystem by providing a secure and convenient digital solution, thereby revolutionizing the way agricultural documentation is managed.

1.2 Purpose

The purpose of this project is to modernize and optimize the agricultural documentation process. It aims to provide a secure, user-friendly platform for farmers, suppliers, and regulatory authorities to efficiently manage and track agricultural records. By offering streamlined registration and login procedures, personalized dashboards, and robust security measures, the project enhances accessibility, transparency, and data integrity within the agricultural ecosystem. The primary goal is to foster trust, promote best practices, and reduce fraud by digitizing and centralizing agricultural documentation. Ultimately, this project seeks to revolutionize the agricultural industry by improving record-keeping and collaboration among stakeholders, leading to increased productivity and sustainability.

2.LITERATURE SURVEY

2.1 Existing problem

The agricultural sector is a vital component of the global economy, providing essential food and resources. However, this sector faces several challenges, including problems with agricultural documentation. This report aims to outline and analyze the existing problems in agricultural documentation processes that hinder productivity, transparency, and efficiency within the industry.

- One of the primary challenges in agriculture is the heavy reliance on manual and paper-based documentation. Farmers, suppliers, and regulatory bodies still predominantly maintain hard-copy records, which are time-consuming to update, vulnerable to damage or loss, and cumbersome to share among stakeholders.
- Agricultural documentation varies greatly in format, content, and methodology. The absence of standardized practices makes it challenging to compare data, share information, and conduct efficient data analysis, hindering decision-making and industry improvements.
- Many agricultural stakeholders, especially small-scale farmers, lack access to modern technology. This digital divide limits their ability to participate in digital documentation systems, hindering their progress and market access.
- The vulnerability of data to unauthorized access, theft, or manipulation is a significant concern. Inadequate security measures expose sensitive information, undermining the trust of stakeholders and posing a risk to the integrity of the agricultural ecosystem.
- The lack of digital records hampers the retrieval and analysis of critical agricultural data. This inefficiency restricts real-time decision-making, resource allocation, and response to emerging challenges, such as climate change or disease outbreaks.

2.2 References

- G. S. Sajja, K. P. Rane, K. Phasinam, T. Kassanuk, E. Okoronkwo, and P. Prabhue, **"Towards applicability of Blockchain in Agriculture sector**," Materials Today Proceedings, vol. 5, 2021.

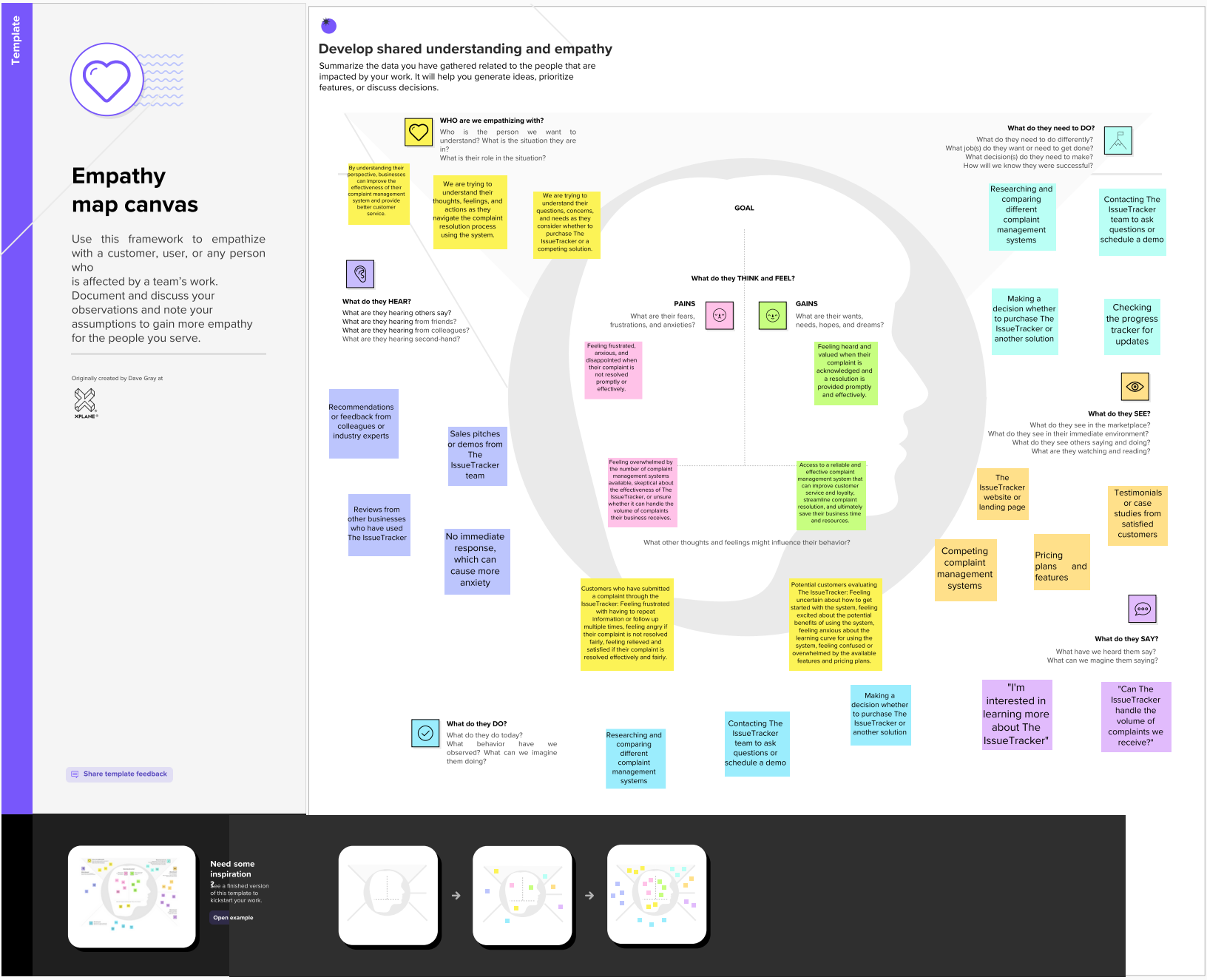
- W. Lin, X. Huang, V. Wang et al., **"Blockchain technology in current agricultural systems: from techniques to applications,"** IEEE Access, vol. 8, pp. 143920–143937, 2020.
- T. H. Pranto, A. A. Noman, A. Mahmud, and A. K. M. Haque, "**Blockchain and Smart contract for IoT enabled smart agriculture,"** 2021.

2.3 Problem Statement Definition

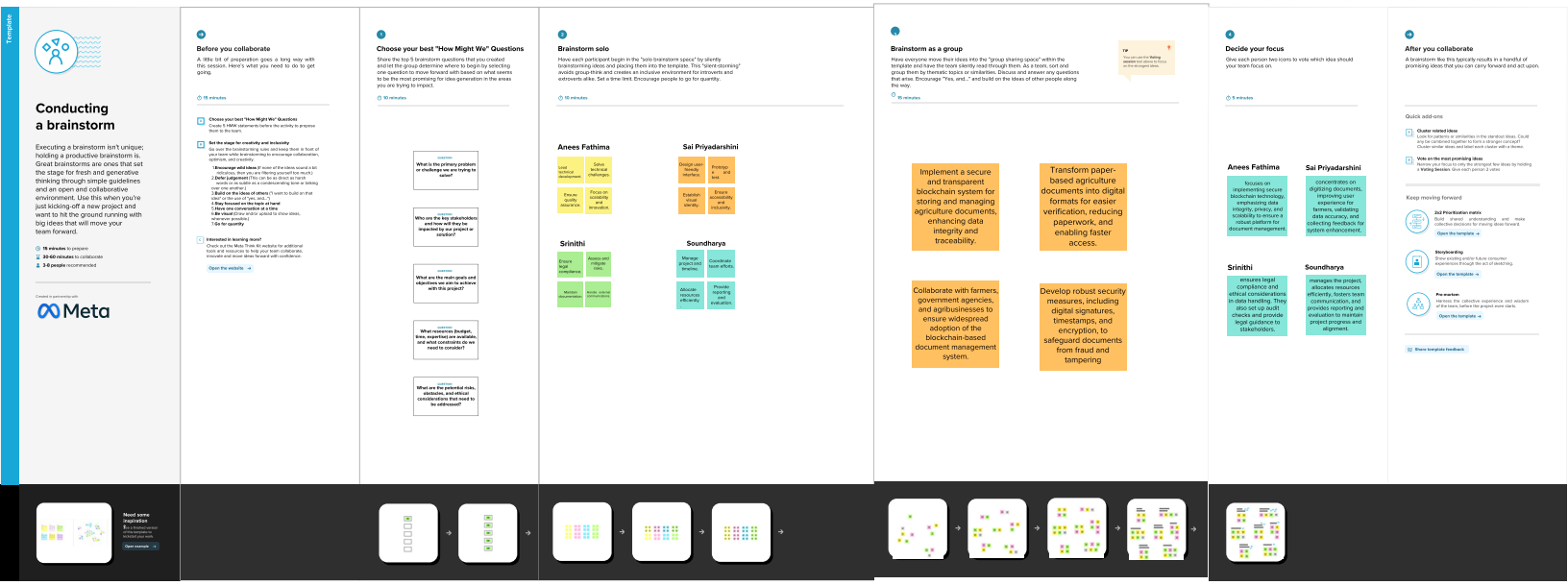
Agricultural documentation in the current ecosystem is predominantly manual and paper-based, characterized by inefficiencies, inaccuracy, and a lack of standardization.This antiquated system leads to significant challenges, including data loss, inaccessibility, and difficulties in data analysis. Small-scale farmers, particularly in remote areas, face barriers due to limited access to digital technology. Furthermore, data security and privacy concerns threaten the integrity of the system.Misrepresentation of data in paper records can lead to fraud, mistrust among stakeholders, and economic losses. The absence of a standardized format for documentation complicates data sharing and analysis across the agricultural sector. In light of these challenges, there is an urgent need for a digital solution that can revolutionize the way agricultural data is documented and managed, enhancing transparency, efficiency, and trust within the industry. The "Agriculture Docs Chain" project seeks to address these issues, offering a secure, standardized, and accessible platform for agricultural documentation.

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

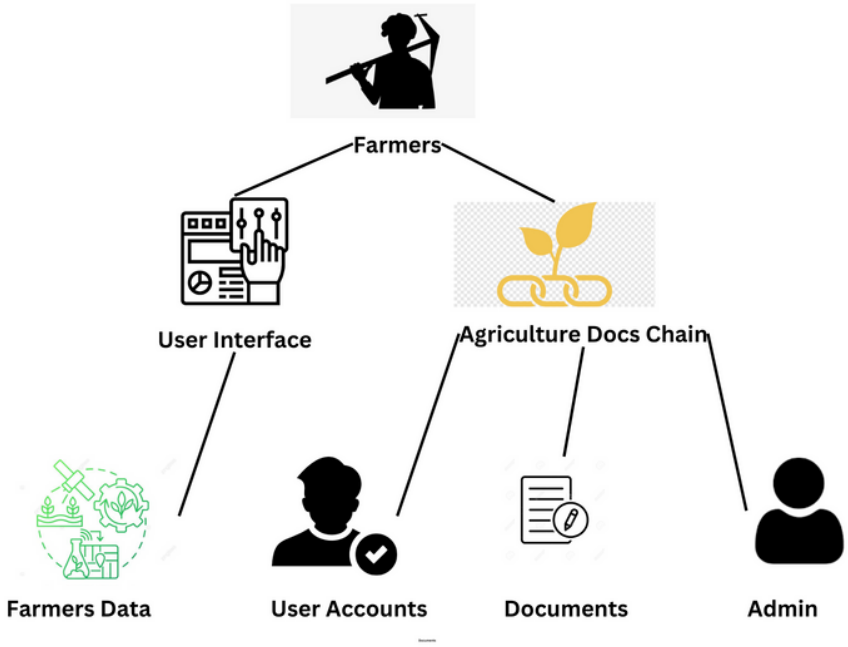
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Users can register by providing their name, email address, and password
FR-2	Verification Email	Upon registration, a verification email should be sent to the user's email address with a confirmation link.
FR-3	Login	Registered users can log in using their email address and password.
FR-4	Password Reset	Users who forget their passwords can request a password reset via email.
FR-5	Dashboard Access	After successful login, users should gain access to their personalized dashboard.
FR-6	Role-Based Access Contro	The system should distinguish between different user roles (e.g., farmers, suppliers, administrators) and grant appropriate access levels and permissions.
FR-7	Document Standardization	The system should enforce standardized formats for agricultural documentation.
FR-8	Data Security	User data should be stored securely, and encryption should be employed to protect sensitive information.
FR-9	Data Privacy	User privacy should be maintained, and data should only be accessible by authorized users.
FR-10	Accessibility	The platform should be designed to be accessible to users with limited technology access, particularly in remote areas.
FR-11	Verification and Confirmation	Verification and confirmation emails should be sent to users to prevent fake accounts and maintain system integrity.
FR_12	Data Retrieval and Analysis	The system should enable efficient retrieval and analysis of agricultural data for informed decision-making.

4.2 Non Functional requirement

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The user interface should be intuitive and user-friendly to ensure that users, including those with limited technical skills, can easily navigate and use the system.
NFR-2	**Security**	The system must implement robust security measures, including data encryption, authentication, and authorization, to protect user data and maintain data integrity.
NFR-3	**Mobile Responsiveness**	The system's user interface must be responsive, allowing for smooth operation on various mobile devices and screen sizes.
NFR-4	**Performance**	The system should be able to handle a high volume of complaints and concurrent users without significant performance degradation
NFR-5	**Accessibility**	The system should be accessible to users with disabilities, complying with accessibility guidelines and standards
NFR-6	**Scalability**	The system should be scalable, allowing for future growth in terms of complaint volume, user base, and system requirements
NFR-7	**Maintainability**	The system should be easily maintainable, allowing for updates, bug fixes, and modifications with minimal disruption to the overall system
NFR-8	**Interoperability**	The system should be able to integrate with external systems and platforms, such as CRM software, email clients, and communication channels
NFR-9	**Data Backup and Recovery**	Regular data backups and a reliable recovery process must be in place to prevent data loss and ensure business continuity.
NFR-10	**Audit Trail**	The system should maintain a comprehensive audit trail to track all user actions and system events, providing transparency and accountability.

5. PROJECT DESIGN

5.1 Data Flow Diagrams & User Stories



User Story 1: Farmer Registration

As a farmer, I want to register on the platform by providing my name, email, and password, allowing me to access my account and submit agricultural documents securely. This simplifies the onboarding process and ensures data integrity.

User Story 2: Document Submission

As a farmer, I need to be able to submit various agricultural documents, such as crop records and production reports, for record-keeping, analysis, and regulatory compliance. This feature streamlines data submission and enhances transparency.

User Story 3: User Account Management

As an admin, I should be able to manage user access, create, modify, or deactivate accounts, ensuring the system's security and efficiency while preventing unauthorized access.

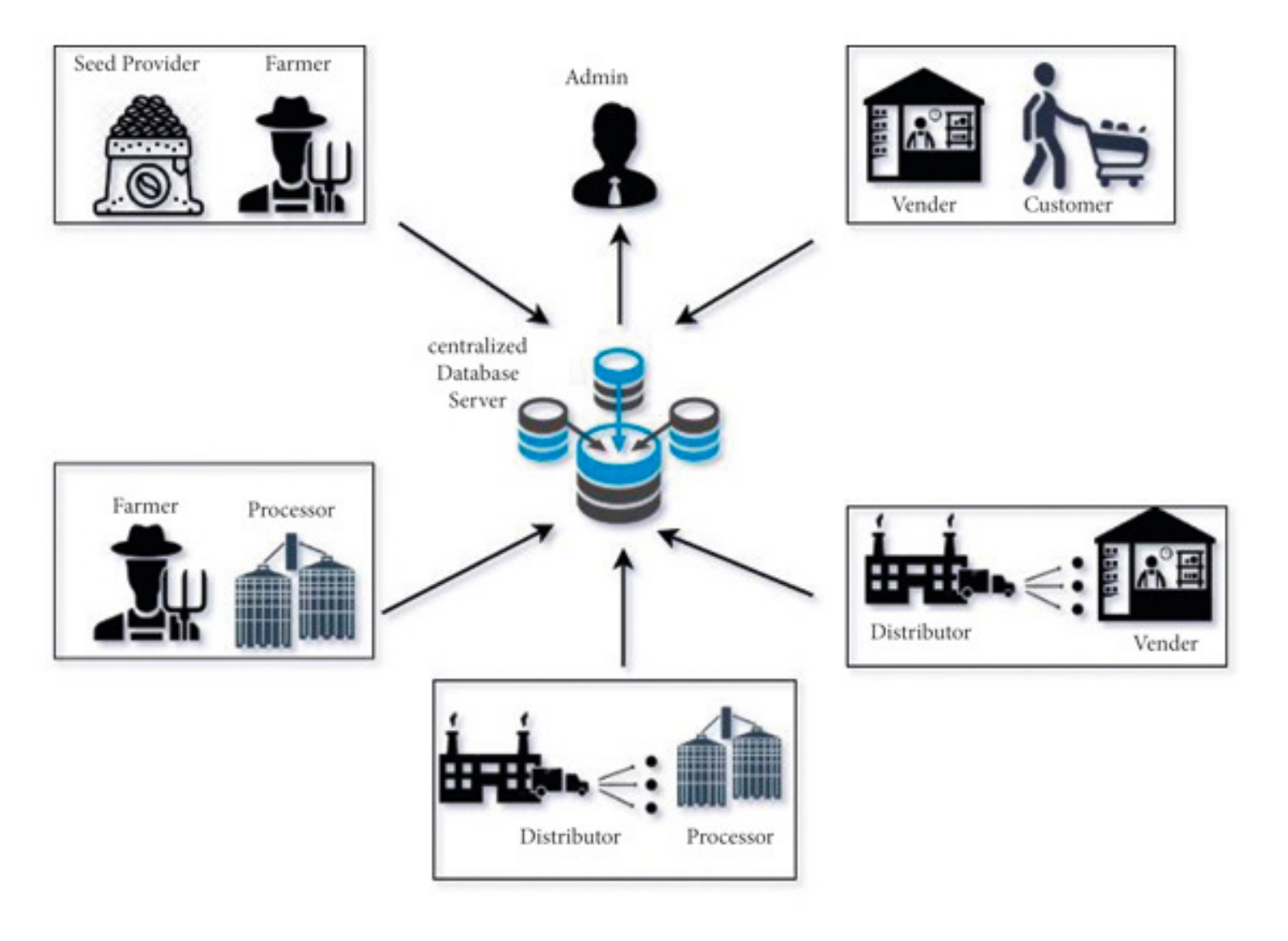
User Story 4: Data Security

As a user, I want my data to be encrypted and protected from unauthorized access, ensuring the confidentiality and integrity of my agricultural records.

User Story 5: Data Retrieval

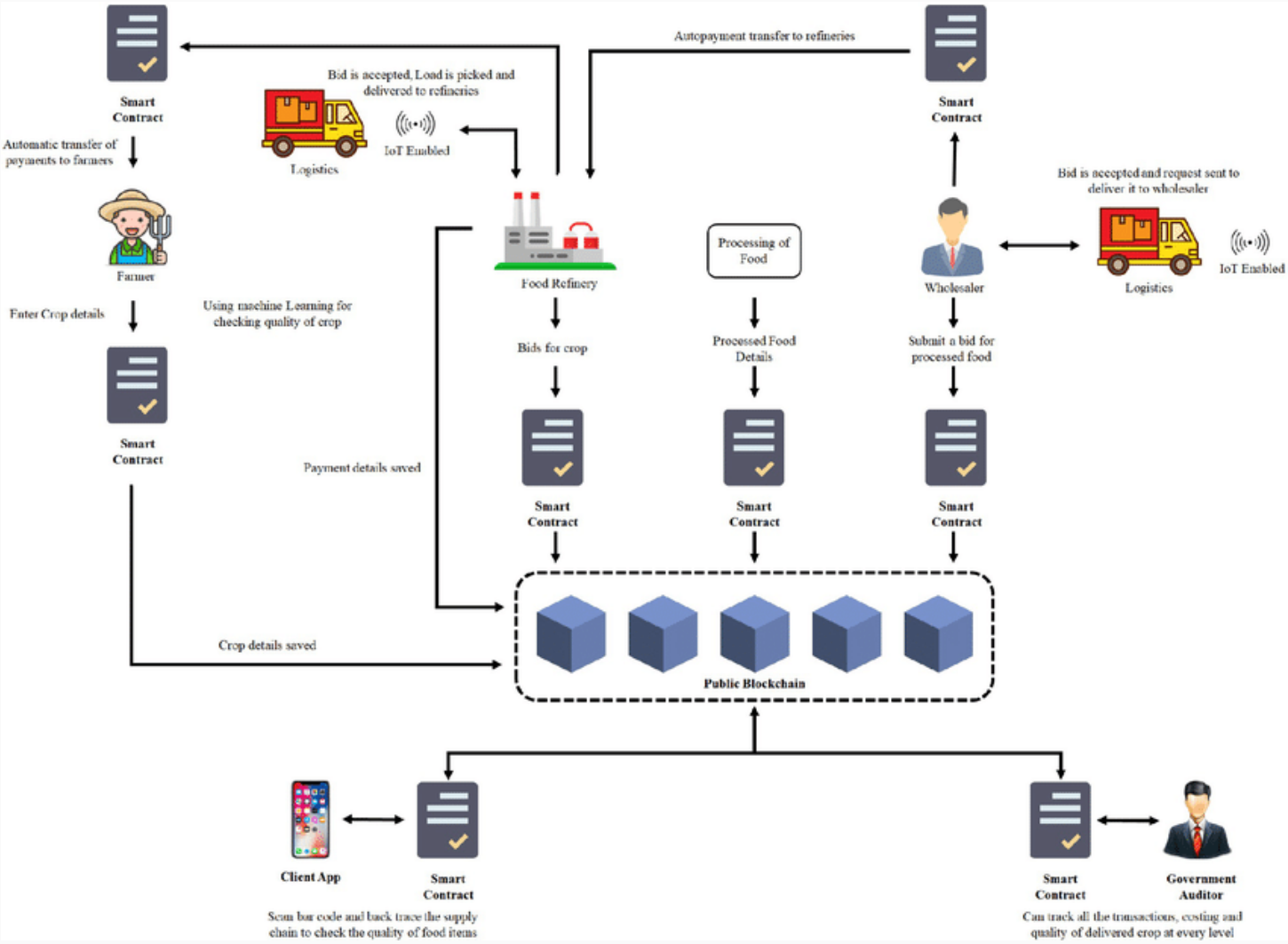
As a user, I need the system to provide quick and efficient data retrieval and analysis, enabling me to make informed decisions and manage my agricultural operations effectively.

5.2 Solution Architecture



6. PROJECT PLANNING & SCHEDULING

6.1 Technical Architecture



6.2 Sprint Planning & Estimation

- Sprint planning and estimation for the "Agriculture Docs Chain" project involve breaking down the project into smaller, manageable tasks and determining how much work can be accomplished in each sprint. The goal is to deliver a functional, incremental product with each sprint.

- In a typical sprint planning session, the team identifies user stories and tasks, prioritizes them, and estimates the effort required for each. For instance, developing user registration features might be one sprint, while building a secure data storage system could be another.

- Estimation is crucial to allocate resources effectively. Techniques like story points, hours, or t-shirt sizing are employed. A well-defined sprint includes planning, development, testing, and review phases, typically spanning two to four weeks.

- By planning and estimating sprints, the project team can set realistic goals, track progress, and continuously deliver value to users. This agile approach allows for adaptability, aligning development with evolving requirements and ensuring that the Agriculture Docs Chain project remains responsive to user needs.

6.3 Sprint Delivery Schedule

- The Sprint Delivery Schedule for the "Agriculture Docs Chain" project is a critical aspect of Agile project management that outlines when specific increments of work will be delivered to users or stakeholders. This schedule is designed to ensure a consistent and predictable flow of value throughout the project.
- In this project, sprints typically last for two to four weeks, and each sprint is assigned a set of user stories or features to develop and deliver. At the end of each sprint, a review and demonstration are held to showcase the completed work to stakeholders, allowing for their feedback and validation.
- The Sprint Delivery Schedule ensures a steady rhythm of progress and keeps the project aligned with user needs and evolving requirements. It also facilitates transparency and allows the team to make necessary adjustments to their plans. This iterative and incremental approach maximizes efficiency, reduces risk, and provides stakeholders with regular opportunities to see the project's development. It ultimately leads to the successful and timely delivery of the "Agriculture Docs Chain" system.

7. CODING & SOLUTIONING

7.1 Feature 1

User Registration and Verification

1. Smart Contract (Solidity):

- Develop a Solidity smart contract to manage user registration and verification.
- Include functions for user registration, email verification, and account activation.

2. Front-end (React):

- Create a user registration form in your React app using HTML and CSS.
- Implement a form submission handler in JavaScript.
- Connect Metamask to the app to facilitate user registration.
- Send a transaction to the Ethereum network to register the user on the smart contract.

3. Verification Email (JavaScript and JSON):

- Generate a unique verification token and store it in a JSON file or the blockchain.
- Send a verification email with the token using JavaScript.

4. Account Activation:

- Create an activation endpoint in your smart contract.
- Implement account activation in your React app by interacting with the smart contract.
- Verify the user's token from the verification email.

7.2 Feature 2

Document Submission and Storage

1. Smart Contract (Solidity):

- Extend your smart contract to allow users to submit documents.
- Include functions to upload documents and record document details on the blockchain.

2. Front-end (React):

- Add a document submission form to your React app using HTML and CSS.
- Create a file input field and a form to gather document details.
- Implement a file upload handler using JavaScript.
- Use Metamask to send transactions for document submission.
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3. Document Storage (Solidity and Ethereum):

- Store document data on the Ethereum blockchain or IPFS.
- Record document references in your smart contract.
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4. User Access:

- Implement user authentication to ensure that only authorized users can access their submitted documents.
- Use Metamask for user authentication when accessing documents.

7.3 Database Schema

- A database schema for the "Agriculture Docs Chain" project is the blueprint that defines the structure, organization, and relationships of data within the system.

- In this context, the schema should accommodate user registration, document submission, and other relevant data.

- For user registration, the schema includes tables for user details, login credentials, and account verification information. Document submission requires a separate table to store document metadata and references.

- Each table will have primary and foreign keys to establish relationships and maintain data integrity.

- The schema design also considers security measures and access controls. It outlines how data is structured, stored, and retrieved, facilitating efficient and secure data management.

- In a relational database, like PostgreSQL or MySQL, tables are used to represent these entities, while in a NoSQL database, such as MongoDB, collections serve a similar purpose.

- The schema serves as a foundation for database implementation and maintenance, ensuring data consistency and accessibility for the "Agriculture Docs Chain" project.

8. PERFORMANCE TESTING

8.1 Performace Metrics

Performance testing involves the measurement and analysis of various performance metrics to assess a system's behavior and identify areas for improvement. Here are some common performance metrics used in performance testing:

- **Response Time:**

The time taken for a system to respond to a user request. It's a critical metric for assessing user experience and system responsiveness.

- **Throughput:**

The number of transactions or requests processed by the system in a unit of time. It indicates the system's capacity to handle a load and is often measured in requests per second (RPS).

- **Concurrency:**

The number of users or processes interacting with the system simultaneously. Measuring concurrency helps evaluate how well the system manages multiple simultaneous requests.

- **Error Rate:**

The percentage of failed transactions or requests during testing. A high error rate may indicate performance issues or system instability.

- **Resource Utilization:**

Monitoring the utilization of system resources like CPU, memory, disk, and network bandwidth. High resource utilization can lead to performance bottlenecks.

- **CPU Utilization:**

The percentage of CPU capacity used during testing. High CPU utilization can lead to system slowdowns.

- **Memory Usage:**

Monitoring memory consumption helps identify memory leaks and inefficient memory management.

- **Network Latency:**

The delay in data transmission between the client and the server. High network latency can affect response times.

- **Page Load Time:**

Relevant for web applications, this metric measures the time it takes to load a web page, including all its resources (HTML, CSS, images, scripts).

- **Transaction Response Time:**

Specific to database systems, it measures the time it takes for a database transaction to complete.

- **Hit Rate:**

In caching systems, this metric indicates the percentage of requests served from cache, reducing the load on the backend.

- **Database Query Time:**

The time taken to execute database queries, important for applications heavily reliant on database operations.

- **Transaction Success Rate:**

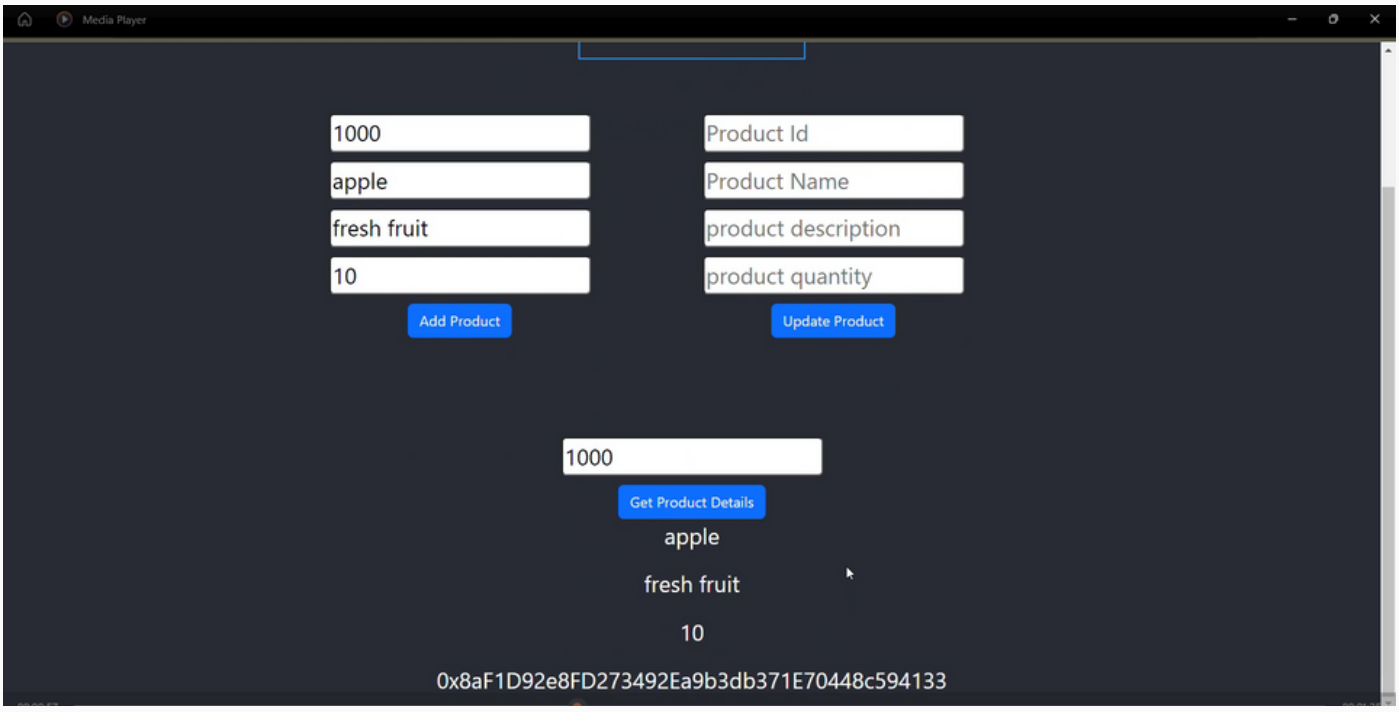
The percentage of successfully completed transactions or operations during testing.

- **Server and Network Errors:**

The number and type of server and network errors encountered during testing.

9. RESULTS


Agriculture Registry
0x8af1....594133
1000
apple
fresh fruit
10
Add Product
Product Id
Product Name
product description
product quantity
Update Product
Enter Id
Get Product Details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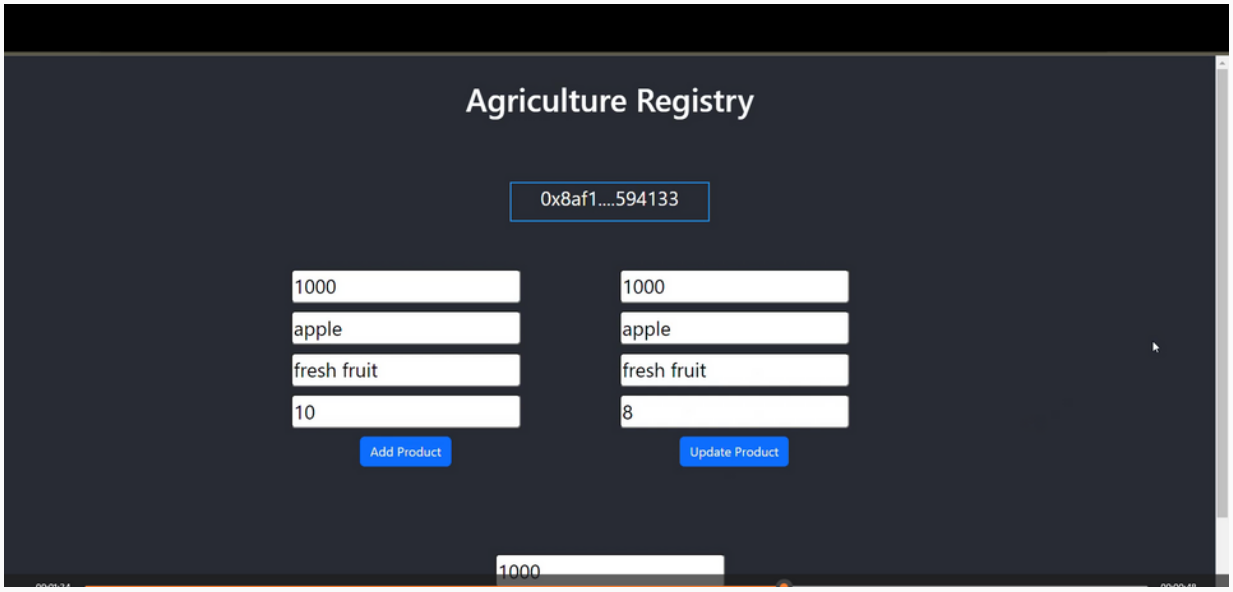
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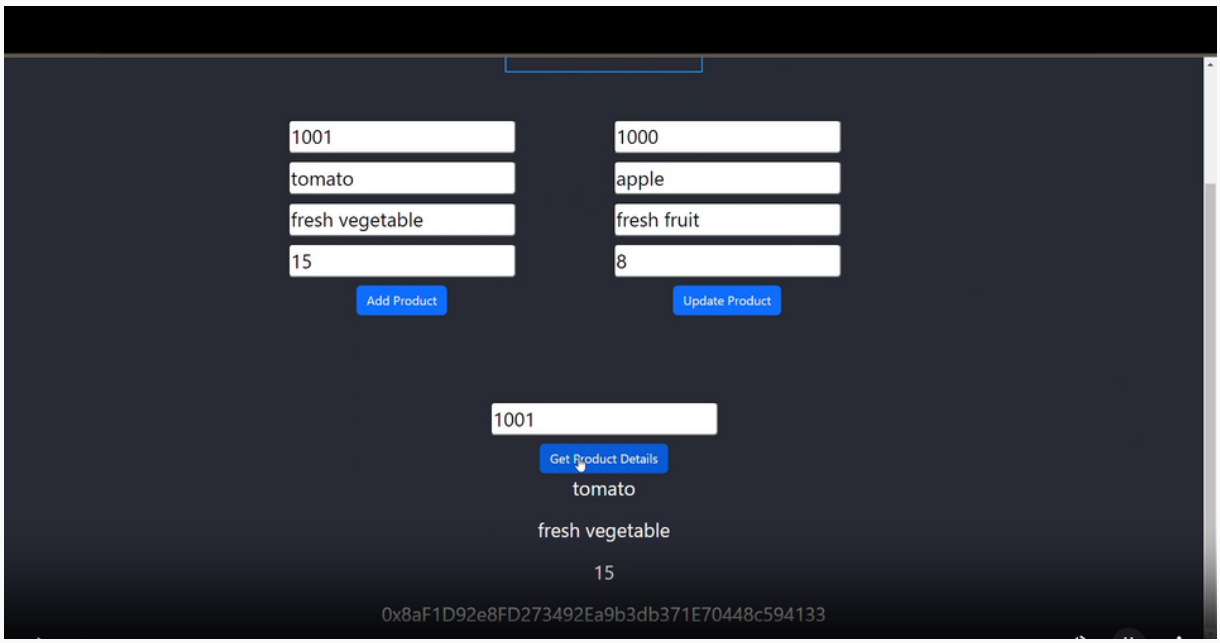
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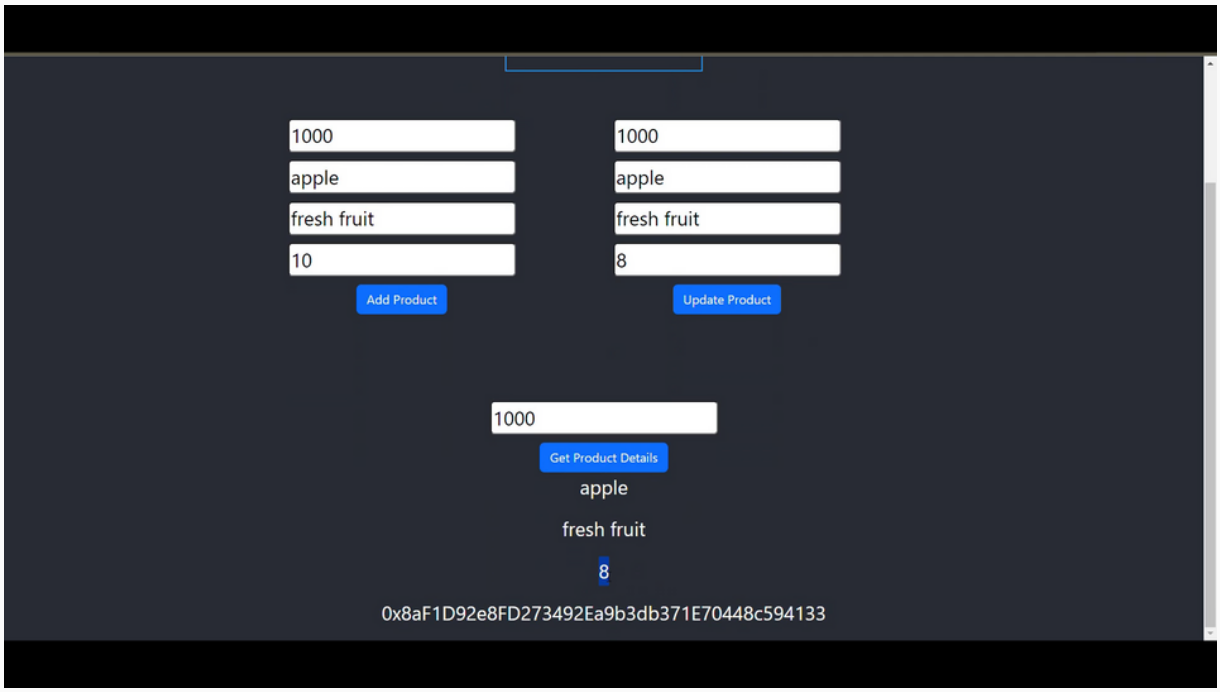
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10. ADVANTAGES & DISADVANTAGES

ADVANTAGES

- **Enhanced Data Accuracy:**

Digital documentation reduces the risk of errors and data inconsistencies compared to manual paper-based record-keeping.

- **Transparency:**

Blockchain technology ensures transparent and tamper-resistant records, which can help build trust among stakeholders.

- **Data Accessibility:**

Farmers and other users can easily access their agricultural data from anywhere, making it more convenient to manage their operations.

- **Regulatory Compliance:**

The system can assist farmers in complying with agricultural regulations and standards, reducing the risk of non-compliance.

- **Improved Decision-Making:**

Access to historical agricultural data enables farmers to make informed decisions, such as crop planning, resource allocation, and risk management.

- **Efficient Reporting:**

Streamlined digital processes reduce paperwork and simplify reporting, saving time and resources.

- **Security:**

Data is stored securely on the blockchain, reducing the risk of data loss, theft, or tampering.

- **Auditability:**

The system maintains a detailed audit trail, which can be crucial for traceability and accountability.

- **Real-time Data:**

The system allows for the recording of real-time data, which is valuable for monitoring and making timely decisions.

DISADVANTAGES

- **Limited Technology Adoption:**

Many farmers in rural or less developed areas may lack access to the necessary technology, such as smartphones and reliable internet connections, which can hinder their participation in the system.

- **Data Privacy and Security:**

Storing sensitive agricultural data on a blockchain or any digital system poses data security and privacy risks. Unauthorized access, data breaches, or misuse of data could jeopardize farmer trust.

- **User Training:**

Farmers and agricultural workers may require training to effectively use the system, which can be time-consuming and resource-intensive.

- **Maintenance and Updates:**

Ongoing maintenance and updates are necessary to ensure system reliability and security. Neglecting these aspects can result in system vulnerabilities and downtime.

- **Dependency on Internet Connectivity:**

The system heavily relies on internet connectivity. Poor connectivity in rural areas can disrupt data submissions and access.

- **Cost of Implementation:**

Developing and maintaining such a system can be costly, which might not be feasible for some agricultural organizations or governments.

- **Blockchain Scalability:**

Blockchain technology, while secure, may have scalability limitations, potentially slowing down as the number of transactions and users increases.

- **Environmental Concerns:**

Blockchain technology, if not energy-efficient, may contribute to environmental concerns due to its high energy consumption in some implementations.

11. CONCLUSION

In conclusion, the "Agriculture Docs Chain" project holds great promise for revolutionizing agricultural data management and transparency.
By leveraging blockchain technology and a digital ecosystem, it seeks to streamline processes, enhance data integrity, and empower farmer and stakeholders with valuable insights.

However, it is crucial to recognize that this project faces various challenges, including technology adoption barriers, data privacy concerns, and infrastructure limitations.
Overcoming these hurdles will require a multi-faceted approach, involving not only technological innovation but also user education, regulatory compliance, and careful consideration of the unique needs of the agricultural sector.

In the end, the success of the "Agriculture Docs Chain" project will depend on its ability to balance innovation with practicality and adaptability.
With a strong focus on security, usability, scalability, and community engagement, this project can unlock the full potential of blockchain technology to foster sustainable agriculture and improve the livelihoods of farmers worldwide.
It is a step toward a more transparent and data-driven future for the agricultural industry.

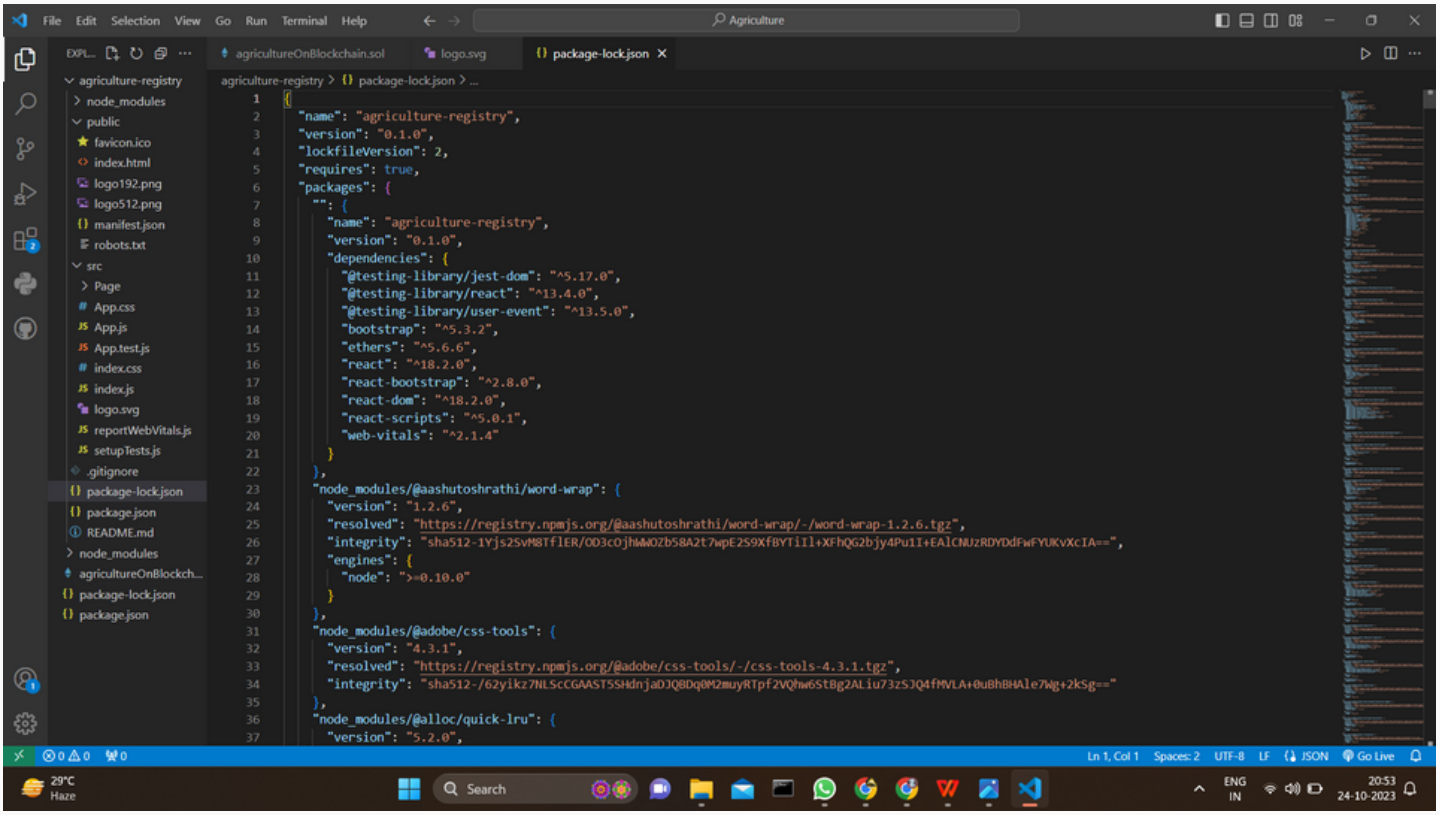
12. FUTURE SCOPE

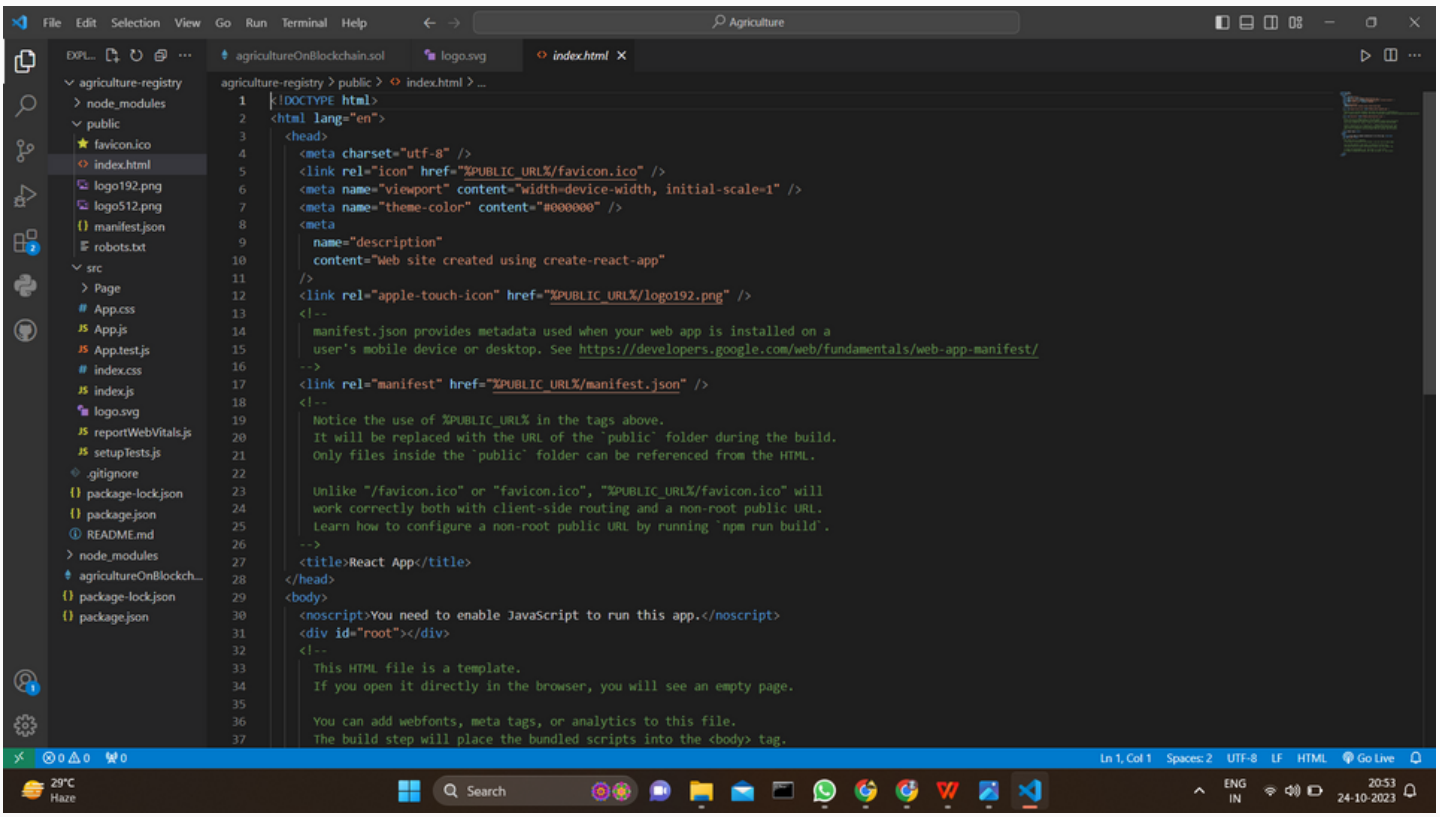
- **Global Adoption:** The project can extend its reach to emerging economies and regions with large agricultural sectors, bringing the benefits of transparent and efficient data management to a broader global audience.
- **Integration with IoT and AI**: Incorporating Internet of Things (IoT) devices and Artificial Intelligence (AI) technologies can provide real-time data on crop health, weather conditions, and predictive analytics, further empowering farmers to make informed decisions.
- **Supply Chain Traceability**: Extending the blockchain's use to trace the entire agricultural supply chain, from farm to table, can enhance food safety, quality, and transparency for consumers.
- **Smart Contracts:** Implementing smart contracts can automate processes like payments to farmers and supply chain stakeholders based on predefined conditions, reducing paperwork and enhancing efficiency.
- **Data Analytics:** Harnessing the vast amount of agricultural data collected can lead to insights that improve crop yield, resource management, and sustainability practices.
- **Mobile Access:** Developing mobile applications that are accessible and user-friendly can help overcome the digital divide in rural areas and enable even more farmers to participate.
- **Blockchain Scalability:** Exploring blockchain scaling solutions like sharding and layer 2 solutions to accommodate a growing user base and transaction volume.
- **Ecosystem Expansion:** Collaboration with government agencies, NGOs, and private sector partners can foster a comprehensive agricultural ecosystem that addresses broader challenges, from subsidies to market access.
- **Regulatory Compliance:** Ensuring that the system complies with evolving data privacy and agricultural regulations will be vital to its long-term success.

13. APPENDIX

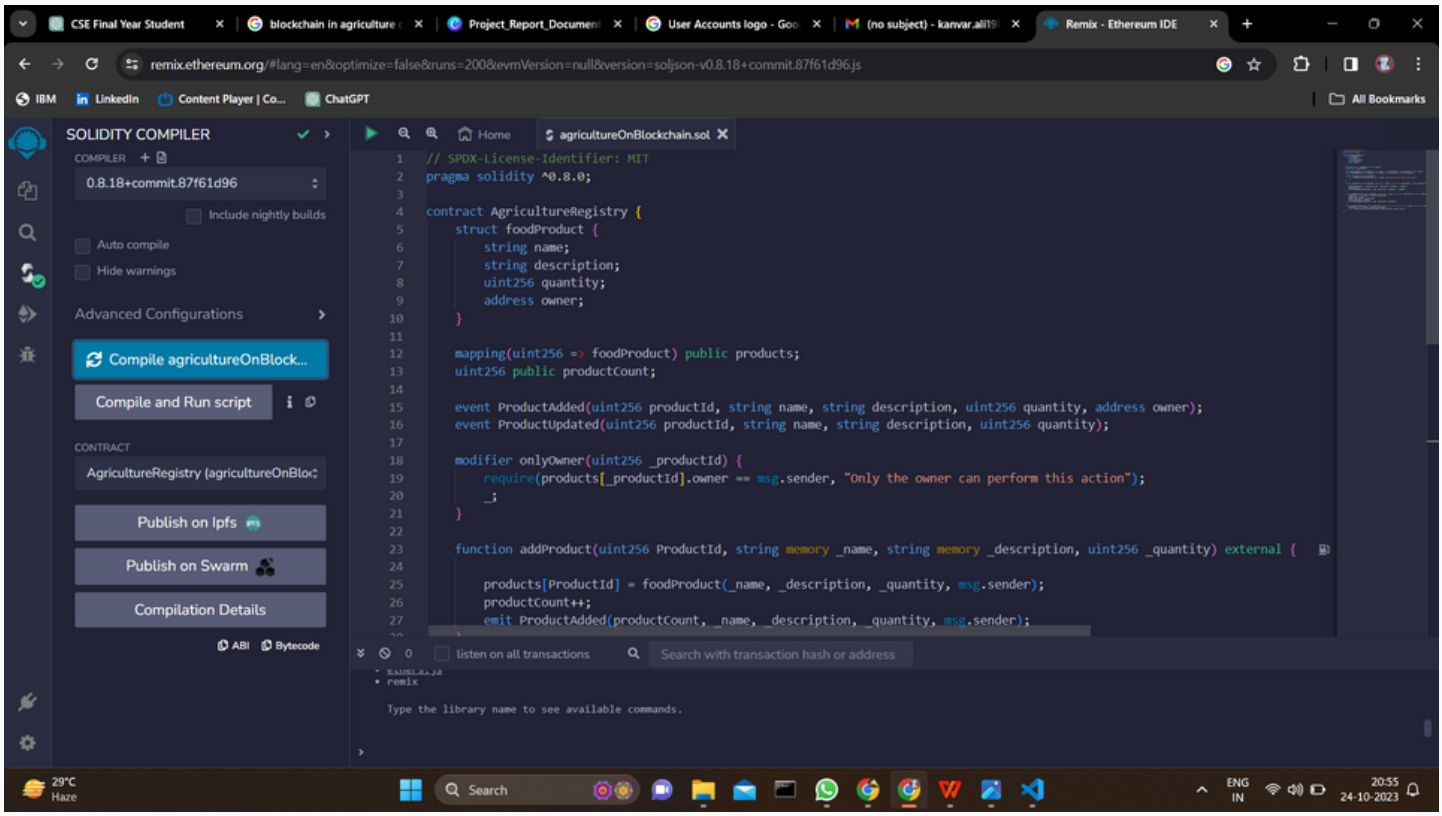
Source Code

Frontend - VScode

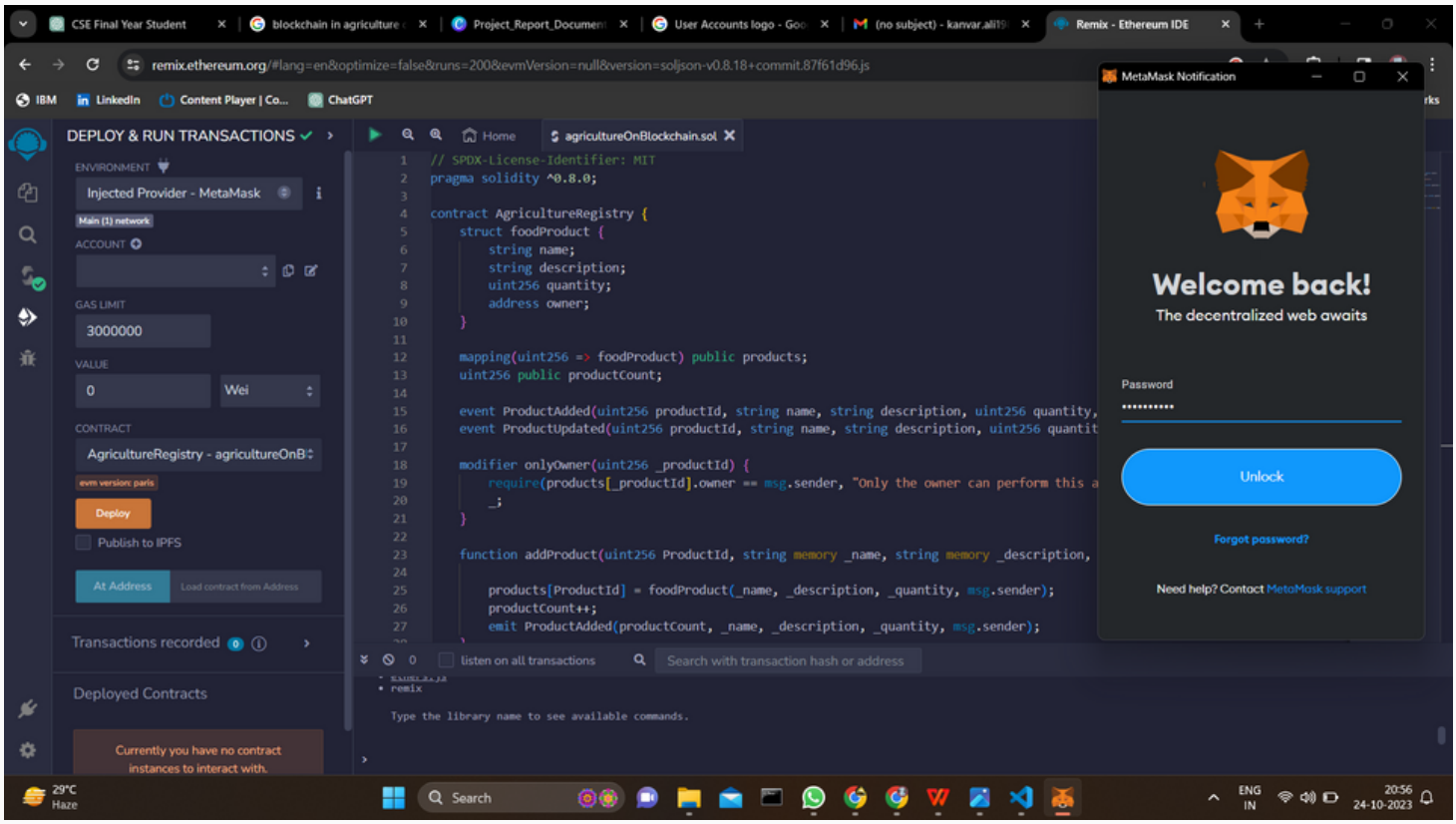




Remix IDE



Metamask Connection



GitHub & Project Demo Link

Github Repository Link:

https://github.com/AneesFathima24/NM-Agriculture-docs-chain.git

Demo link:

https://drive.google.com/file/d/1W-CWRvxIYYqsTw1ICXB2hR4l8qnuYnLo/view?usp=sharing