

ASSURED CONTRACT FARMING SYSTEMS FOR STABLE MARKET ACCESS

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Abstract: Agriculture faces many problems such as changing market prices, uncertain demand, low bargaining power of farmers, and difficulty in finding reliable buyers. Because of these problems, farmers may not get a fair or stable price for their crops.

An assured contract farming system can help reduce these problems. In this system, farmers and buyers make an agreement before cultivation. They can decide in advance which crop will be grown, the required quality, price, quantity, delivery date, and payment conditions.

This research proposes a digital contract farming system that brings farmers, buyers, agricultural experts, and administrators together on one platform. The system stores important information such as crop details, contracts, expected production, agreed prices, quality requirements, delivery schedules, and payment records.

The system also provides notifications and status updates to improve communication between farmers and buyers. Keeping clear digital records can help reduce misunderstandings and disputes and can increase trust between both parties.

The main purpose of this system is to provide farmers with better and more stable market access, reduce uncertainty after harvesting, and help them plan their farming activities. It can also help buyers receive the required crops with the agreed quality and quantity. The research also focuses on the feasibility, requirements, risks, system design, and future development of the proposed system.

Keywords: Contract Farming, Market Access, Farmers, Digital Agriculture, Smart Contracts, Supply Chain, Price Assurance.

I .INTRODUCTION

1.Background

Agriculture is an important source of income and livelihood for many people. However, farmers often face problems after producing their crops because they may not know the final market price or whether they will find a suitable buyer. Small and marginal farmers also face difficulties such as transportation, checking crop quality, delayed payments, and getting correct information about market demand. Because of these problems, farmers may earn less profit even when their crop production is good.

Contract farming is a system where farmers and buyers make an agreement before or during the cultivation of crops. In this agreement, they can decide important things such as the crop, quantity, quality, price, delivery, and payment conditions.

A digital contract farming system can make this process easier by keeping all agreements and important information in one place. The proposed assured contract farming system aims to provide farmers with more stable market access. It records contracts, tracks important farming activities, helps farmers and buyers communicate, and keeps clear records of transactions. This can reduce misunderstandings, improve trust, and make the overall farming and selling process more organized.

2 Importance

The assured contract farming system is important because it helps farmers get better and more reliable access to the market. Farmers can connect with buyers before harvesting, which gives them more confidence about selling their crops.

The system provides clear information about important details such as the agreed price, quantity, quality, delivery date, and payment conditions. This helps farmers and buyers understand their responsibilities clearly.

Using digital contracts and transaction records makes the entire process more transparent. It also improves communication between farmers and buyers and reduces the chances of misunderstandings.

The system helps farmers plan their production according to the requirements of buyers. It can also reduce disputes because all the agreed terms and previous activities are stored as digital records.

Overall, the system can help small and marginal farmers become part of organized supply chains and provide them with better opportunities to sell their agricultural products. [1], [2]

3 Assured Contract Farming

Assured contract farming is a planned system in which farmers and buyers make an agreement before the crop is produced. The main purpose of this agreement is to give farmers a more certain market and help them know in advance how their crop will be sold.

The agreement can include important details such as the type of crop, quantity or area of cultivation, required quality, farming inputs, expected price, delivery date, inspection process, and payment conditions.

A digital platform can make this process easier by storing all the contract information in one place. Farmers and buyers can check the contract details, track the progress of the agreement, and receive updates when required. The system can manage the process from creating the contract until the crop is delivered and the final payment is completed.

Overall, assured contract farming can improve communication between farmers and buyers, provide better market planning, and reduce uncertainty related to selling agricultural products.

4 Types of Contract Arrangements

There are different types of contract arrangements used in agriculture. These arrangements help farmers and buyers decide the terms of production and sale of agricultural products.

1.Fixed-Price Contract:In this type of contract, the farmer and buyer decide the price before the crop is produced or delivered. This gives the farmer an idea of how much money they will receive after selling the crop.

2.Market-Linked Contract:In this arrangement, the final price depends on the market price. A specific market, price index, or formula is used to calculate the final selling price. This allows the price to change according to market conditions.

3.Buy-Back Arrangement:In this type of agreement, the buyer promises to purchase the farmer's produce if it meets the agreed quality and other requirements. This gives farmers better confidence that they will have a buyer after harvesting.

4.Production Agreement:This contract mainly focuses on how the crop should be produced. It includes details such as production methods, quantity, quality standards, and delivery requirements. Farmers are expected to follow the agreed production conditions.

5.DigitalSmart-Contract Model:In this model, the contract details are stored digitally using software. Important conditions and milestones can be recorded and tracked automatically. This can make the contract process faster, more transparent, and easier to manage. [1], [6]

5 Research Problems

Farmers face several problems while selling their agricultural products. One major problem is the uncertainty about finding buyers and getting a suitable market price after harvesting. Individual farmers may also have limited bargaining power, which can make it difficult for them to negotiate better prices with buyers.

Another important problem is the lack of proper records for agreements, prices, quality requirements, and payments. This can create misunderstandings between farmers and buyers. Differences in the quality of agricultural products can also lead to disputes.

Farmers may sometimes experience delays or uncertainty in receiving payments. In addition, poor coordination between production, collection, transportation, and delivery can make the selling process more difficult.

Farmers may also not receive timely information about what buyers need, such as crop type, quantity, quality, and delivery requirements.

Therefore, this research focuses on developing an assured contract farming system that can provide more stable market access through digital contracts, transparent records, progress tracking, and better communication between farmers, buyers, agricultural experts, and other stakeholders.

6 Scope

The proposed assured contract farming system covers the main activities involved in connecting farmers and buyers and managing their agreements digitally.

First, the system allows farmers to register and create their profiles with basic information. Buyers can also register and provide details about their crop requirements, such as crop type, quantity, quality, and expected delivery time.

The system allows farmers and buyers to create and accept digital contracts. Important details such as crop type, quantity, quality standards, agreed price, delivery date, and payment conditions can be recorded in the contract.

The system also provides contract status and milestone tracking, allowing stakeholders to monitor the progress of the agreement. Quality inspection and delivery confirmation can be recorded to ensure that the agreed requirements are followed.

Payment status can also be tracked through the system so that farmers and buyers can easily check whether a payment is pending or completed.

Finally, the system can provide notifications and basic reports to farmers, buyers, agricultural experts, and administrators. Overall, the scope of the system is to make the contract farming process more organized, transparent, and easier to manage.

7 Objectives

The main objective of the proposed system is to develop a digital platform for assured contract farming that can provide farmers with stable and reliable market access. The system aims to create a common platform where farmers can connect with verified buyers and understand their crop requirements in advance. It focuses on maintaining transparent digital records of contracts, including crop details, quantity, quality standards, agreed prices, delivery schedules, and payment conditions.

The proposed system also aims to support the monitoring of important farming activities such as production, quality inspection, delivery, and payment. It helps farmers plan their cultivation according to confirmed buyer demand and requirements. The system is also intended to improve communication and transparency among farmers, buyers, agricultural experts, and administrators. By maintaining proper digital records, it can help reduce misunderstandings and disputes between the parties involved.

Overall, the objective of the system is to make contract farming more organized, transparent, reliable, and efficient. The study also aims to examine the feasibility, requirements, risks, and future scalability of the proposed system so that it can be effectively used on a larger scale.

8 Need of the System

A digital assured contract farming system is needed to reduce the uncertainty that farmers face between growing crops and selling them in the market. Farmers may not always know the market price, buyer requirements, or whether a buyer will be available after harvesting.

Traditional contract farming methods may depend on paper documents, phone calls, informal communication, and middlemen. These methods can sometimes lead to misunderstandings, delays, and difficulty in maintaining proper records.

A centralized digital platform can keep all contract details and important activities in one place. Farmers can easily check information about crop requirements, agreed prices, quality standards, delivery dates, and payment conditions. This can help farmers plan their cultivation according to confirmed demand and reduce the risk of producing crops without a reliable market.

Buyers can also benefit from the system because they can get a more predictable supply of agricultural products and track important information about the crop. Overall, the system can make the farming and selling process more organized, transparent, and reliable for both farmers and buyers.

9 Selection of Life Cycle Model for Development

The **Incremental Model** is suitable for developing the proposed assured contract farming system because the system can be developed in small modules or parts. Each module can be developed, tested, and improved separately before moving to the next part.

For example, important modules such as farmer registration, buyer management, contract management, notifications, quality monitoring, delivery tracking, and payment tracking can be developed step by step.

In the beginning, a basic version of the system can be developed and tested with a small number of users. Based on their feedback, improvements can be made before adding more features and users.

This approach helps identify errors and usability problems at an early stage. It also makes the development process easier to manage and allows the system to be expanded gradually for a larger number of farmers and buyers

II. LITERATURE REVIEW / RELATED WORK

Various research studies and agricultural initiatives have focused on improving the way farmers connect with markets and buyers. These studies have explored areas such as contract farming, digital agricultural marketplaces, crop traceability, supply-chain management, and information systems. The existing work shows that farmers can benefit from reliable market information, clear agreements, proper quality standards, and timely payments. These factors are important for building better and more trustworthy relationships between farmers and buyers.

Many existing agricultural platforms mainly provide services such as market price information, online buying and selling, farmer group management, supply-chain coordination, or product tracking. However, these systems may focus on only one or two stages of the agricultural selling process. The proposed system combines these different concepts through an assured contract farming approach.

In the proposed system, the process starts with identifying the buyer's requirements and creating a contract with the farmer. The system then supports the monitoring of crop production, quality checking, delivery, and payment. This provides a complete digital process from the initial agreement to the final payment. Therefore, the proposed approach focuses on providing stable market access to farmers rather than considering the sale of crops only after harvesting. [1], [2], [4], [5]

III. METHODOLOGY

The proposed methodology follows a systematic process for developing the assured contract farming system. First, the major problems faced by farmers and buyers are identified, along with the requirements of different stakeholders. The functional and non-functional requirements of the system are then collected and analyzed.

After understanding the requirements, the digital contract workflow is designed to define how farmers and buyers will create, accept, and manage contracts. The system is then developed with different modules such as farmer management, buyer management, administrator management, contract management, and monitoring.

The developed system is tested to check different activities such as contract creation, quality inspection, delivery confirmation, and payment tracking. Different possible situations are considered during testing to identify errors and improve system reliability.

Finally, the proposed system is evaluated based on its feasibility, performance, usability, and future scalability. This methodology helps ensure that the system is properly designed, tested, and suitable for improving market access and coordination between farmers and buyers. [2], [6]

1 Feasibility Study

The feasibility study is conducted to determine whether the proposed assured contract farming system can be developed and used successfully. It considers different aspects such as technical, operational, economic, and legal feasibility.

From a technical point of view, the proposed system can be developed as a web or mobile application with a secure database, user authentication, notifications, and reporting features. These technologies can support the storage and management of contract and transaction information.

From an operational point of view, the system is designed to be simple and easy to use. Farmers and buyers can use basic forms and dashboards to register, create contracts, accept agreements, and monitor their progress. This can make the system useful even for users with limited technical knowledge.

From an economic point of view, the use of digital records and automated notifications can reduce paperwork, administrative work, and communication efforts. Therefore, the system can help reduce operational and coordination costs over time.

Legal and regulatory feasibility is also important for the proposed system. The contracts, payment processes, farmer information, and agricultural transactions must be managed according to applicable laws, government policies, and data-protection requirements. Considering these factors, the proposed system can be considered feasible for further development and implementation. [2]

2 Risk Analysis

Risk analysis is an important part of developing the proposed assured contract farming system. Different types of risks may affect the successful working of the system.

Market risk may occur when there are sudden changes in crop prices. If the contract does not clearly define the pricing method, it may create disagreements between farmers and buyers. Production risk may arise due to factors such as bad weather, pests, diseases, or other unexpected events that can affect the quantity and quality of crops.

Quality risk may occur when farmers and buyers have different expectations about the quality of the produce. Clearly defined quality standards and proper inspection procedures can help reduce such problems. Technology-related risks may include poor internet connectivity, server failures, software errors, or cyberattacks, which can affect the availability and security of the system.

Adoption risk is another important concern because some farmers may have limited knowledge of digital technologies. Proper training and local support can help farmers use the system effectively. Payment-related problems, such as delayed or failed payments, may also reduce trust between farmers and buyers. Finally, legal risks must be considered to ensure that contracts, digital records, payments, and user information follow applicable laws and regulations. [1], [6]

3 Requirement Collection and Identification

The requirements of the proposed system are identified by considering the needs of different stakeholders involved in the agricultural supply chain. These stakeholders include farmers, buyers, agricultural experts, administrators, and other related participants.

The system requires secure user registration and verified profiles so that the users can safely access the platform. It should provide features for creating and accepting digital contracts and recording important crop information such as crop type, quantity, price, quality requirements, and delivery conditions.

The system should also support milestone tracking to monitor production, quality inspection, and delivery activities. Payment status and delivery confirmation should be recorded to provide transparency between farmers and buyers. Notifications can help users receive timely updates about contracts and important activities. Reporting features can also provide useful information to stakeholders and administrators for better monitoring and decision-making.

Overall, the identified requirements are used as a foundation for designing and developing a secure, transparent, and user-friendly assured contract farming system. [2], [4]

4 Software and Hardware Requirements Specification (SRS)

The Software and Hardware Requirements Specification describes the basic hardware, software, network, operating system, and security requirements needed to develop and use the proposed assured contract farming system.

From the hardware point of view, users should have a smartphone or computer to access the system. The system also requires a reliable application server and database infrastructure for storing and managing user, contract, crop, delivery, and payment information.

The software requirements include a web or mobile application as the frontend and a backend application for processing user requests and managing system activities. A relational or document-based database can be used to store the required information. Authentication and notification services are also required for secure login and timely communication with users.

A secure Internet connection is required for communication between users and the system. HTTPS and TLS can be used to protect data while it is being transferred over the Internet. The system should be accessible through commonly used environments such as Android, iOS, Windows, Linux, or modern web browsers.

Security is an important requirement of the proposed system. Role-based access should be used to provide different permissions to farmers, buyers, experts, and administrators. Password protection, secure user sessions, encrypted communication, audit logs, and regular backup mechanisms should be implemented to protect user and transaction information.

Overall, these hardware and software requirements provide the necessary foundation for developing a secure, reliable, and user-friendly digital assured contract farming system. [2]

5 Assumptions

The proposed assured contract farming system is developed based on certain assumptions. It is assumed that farmers and buyers have access to a smartphone or computer along with basic Internet connectivity to use the digital platform.

It is also assumed that users provide correct and complete information about their crops, quantity, quality, pricing, delivery, and payment details. Farmers and buyers are expected to understand and accept the terms and conditions recorded in the digital contract.

The system assumes that the quality standards and inspection procedures are mutually agreed upon by farmers and buyers before the delivery of agricultural products. This helps avoid confusion and disagreements regarding the quality of the produce.

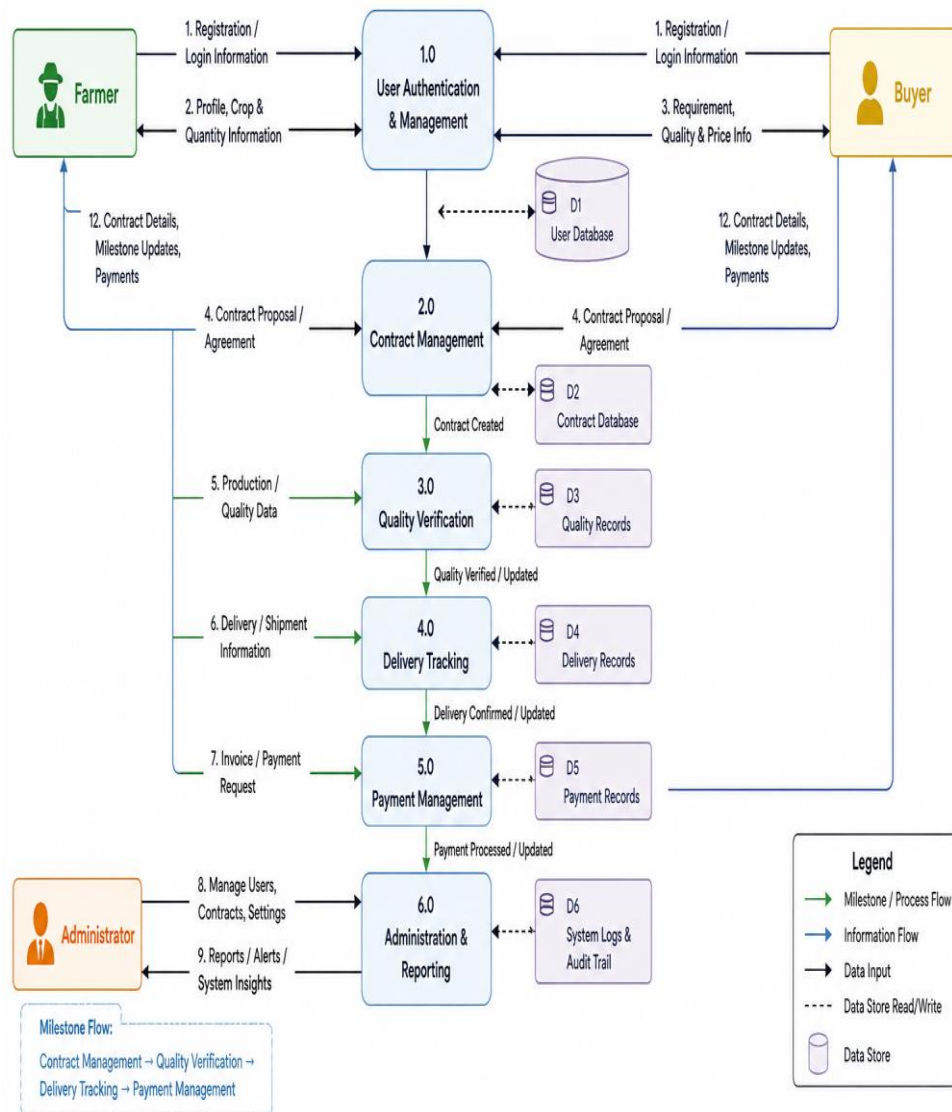
It is further assumed that the payment institutions or online payment gateways connected with the system are available and functioning properly. These assumptions help ensure that the proposed system can operate smoothly and provide reliable services to its users.

IV. DIAGRAM DESIGN

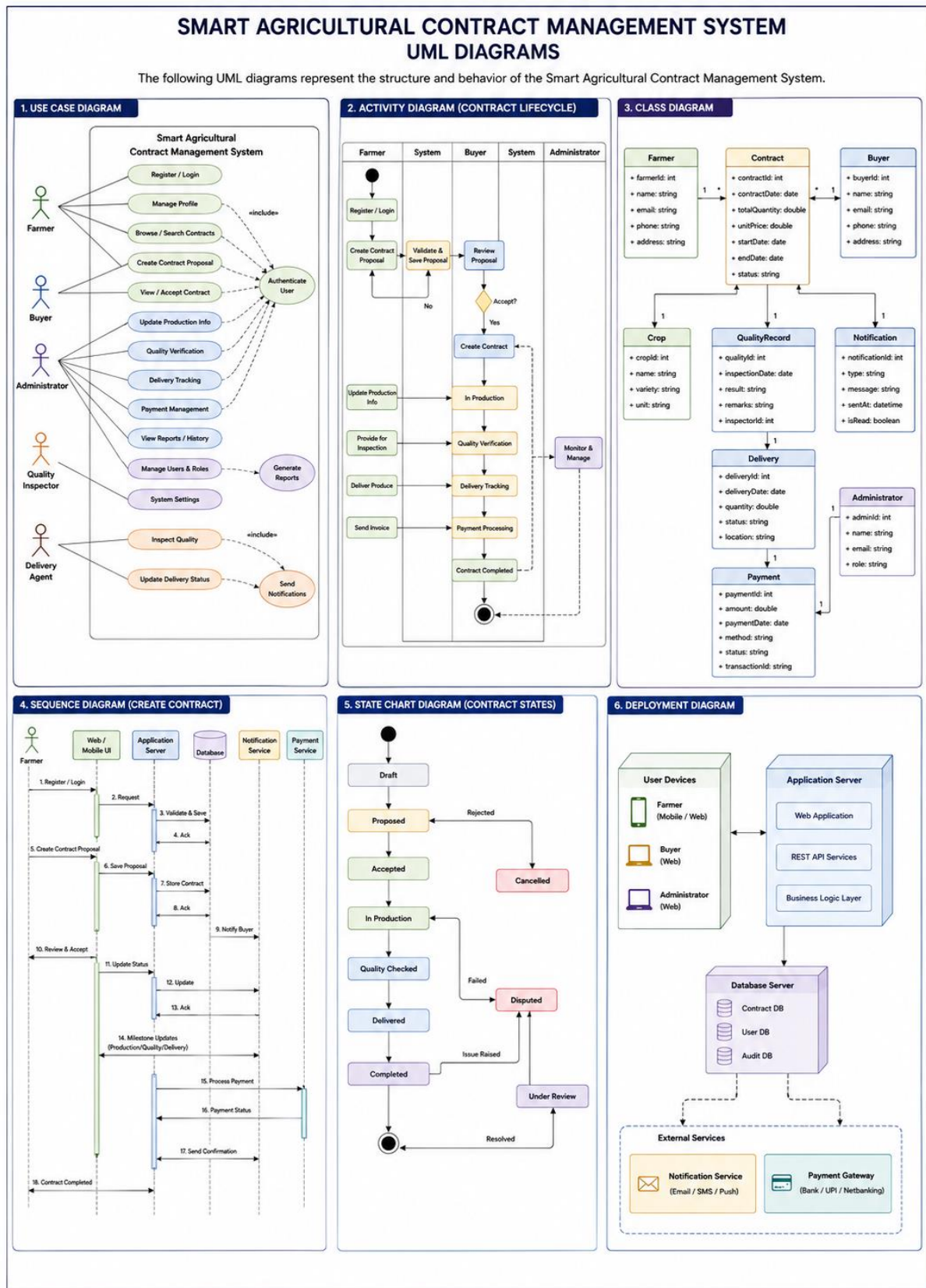
1 Data Flow Diagram (DFD)

4.1 Data Flow Diagram (DFD)

Level 1 DFD – Smart Agricultural Contract Management System

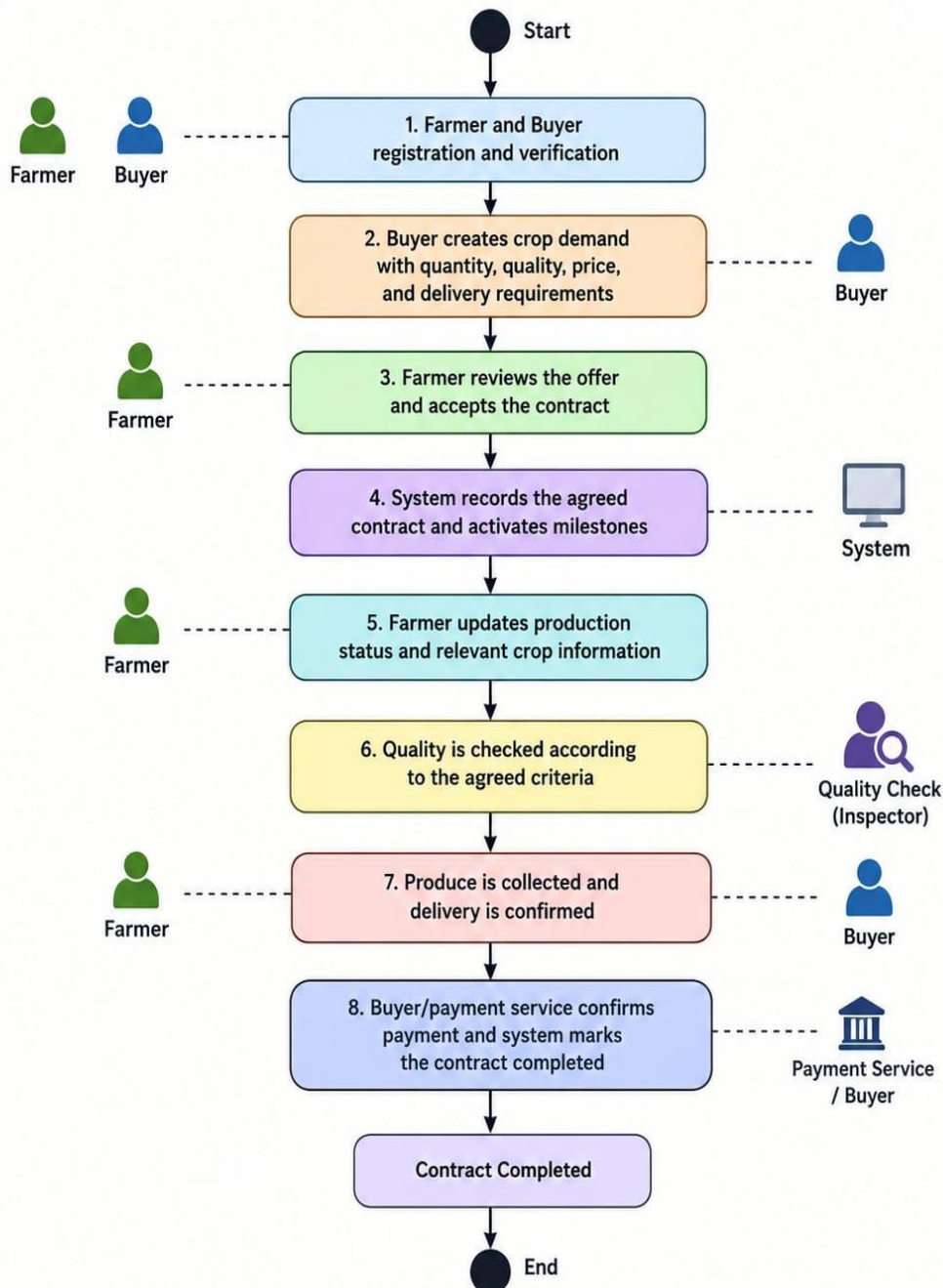


2 UML Diagrams



3 Proposed System Workflow

UML Activity Diagram – Proposed System Workflow



V. EXPECTED RESULTS AND DISCUSSION

The proposed assured contract farming system is expected to improve communication and coordination between farmers and buyers. By keeping important contract information available on a common digital platform, farmers and buyers can easily check the agreed terms and monitor the progress of the contract throughout the crop cycle. The system can help farmers plan their cultivation based on confirmed buyer demand, agreed prices, quantity, and quality requirements. At the same time, buyers can monitor the expected crop supply and delivery progress.

Maintaining digital records of contracts and activities can improve transparency and provide clear information about important milestones.

The proposed system may also help reduce misunderstandings and disputes between farmers and buyers. When details such as price, quantity, quality standards, delivery conditions, and payment terms are clearly defined before cultivation, both parties can better understand their responsibilities.

However, the system cannot completely remove agricultural and market-related risks. Problems such as unexpected weather conditions, crop failure, changes in market prices, and difficulties in using digital technology may still affect the results. Therefore, the system should provide suitable options for handling exceptional situations, a clear process for resolving disputes, and proper support for users who face difficulties while using the platform.

Overall, the proposed system is expected to make contract farming more organized, transparent, and reliable while improving market access and coordination between farmers and buyers.

VI. CONCLUSION

Assured contract farming provides a systematic way to improve market access for farmers by connecting crop production with the confirmed requirements of buyers. The proposed digital system provides a common platform where farmers and buyers can manage contracts, crop details, quality requirements, delivery schedules, and payment information in a transparent manner.

The system can help farmers plan their production with greater confidence and allow buyers to monitor the expected supply and delivery process. Digital records can improve transparency, reduce misunderstandings, and help build trust between farmers and buyers.

The use of the Incremental Model allows the system to be developed and tested step by step. Each module can be checked and improved before the complete system is implemented. With proper user verification, security measures, training, and compliance with applicable rules and regulations, the proposed system can provide a more organized and reliable approach to agricultural marketing.

Overall, the proposed system has the potential to reduce uncertainty, improve coordination, and create stronger and more trustworthy relationships between farmers and buyers.

VII. FUTURE SCOPE

The proposed assured contract farming system can be further improved by adding advanced technologies and features in the future. Artificial Intelligence can be used to analyze crop demand and predict price trends, which can help farmers make better decisions about crop selection and production.

Weather information can also be integrated with the system to provide alerts about rainfall, extreme weather, pests, and other crop-related risks. IoT devices can be used to monitor crop conditions, soil conditions, storage environments, and other important factors in real time.

In the future, digital quality grading can be introduced using images and sensor data to provide more accurate and transparent quality assessment. Geolocation technology can also help in planning crop collection, transportation, and delivery more efficiently.

The system can be developed as a multilingual mobile application so that farmers can use it easily in their local language. Blockchain and smart-contract technologies can also be considered for storing and managing selected important contract records securely.

The proposed system can further be connected with digital payment services, agricultural insurance, warehouses, and online agricultural marketplaces. Analytics dashboards can also be developed to provide useful information to farmer groups, buyers, and administrators for better planning and decision-making.

Overall, these future improvements can make the system more intelligent, secure, user-friendly, and useful for a larger number of farmers and buyers.

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