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AGRICONNECT: A Smart Agricultural Marketplace Application for Direct Farmer-to-Customer Selling

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Abstract

Agriculture is an important sector that supports the livelihood of a large number of people across the world. Many farmers depend on selling their products in the market to earn their income. In the traditional system, farmers usually sell their produce through middlemen such as traders, wholesalers, and retailers. This process reduces the profit earned by farmers and increases the price paid by customers. Because of this, farmers do not get the correct value for their products, and customers are forced to pay more.

To overcome this problem, digital solutions like mobile applications can be used to create a direct connection between farmers and customers. This paper presents Agri-Connect, a mobile-based platform that helps farmers sell their products directly to customers without the involvement of middlemen. Farmers can add product details, update prices, manage stock, and handle customer orders using the application. Customers can view available products, add items to their cart, and place orders easily from nearby farmers.

The application is developed using Flutter for the mobile interface and Firebase services such as Firebase Authentication, Realtime Database, and Storage for backend support. The system provides real-time updates so that both farmers and customers can get the latest information about products and orders. The results show that the system makes the selling process easier, improves communication, and helps farmers get better income while customers get products at fair prices.

Keywords — Smart Agriculture, Mobile Application, Flutter, Firebase, Farmer Marketplace, Agricultural E-commerce.

I. INTRODUCTION

Agriculture is one of the key sectors that supports the economy and food supply of many nations. A large population, especially in developing countries, depends on farming activities for their livelihood. Farmers produce a variety of essential food items such as fruits, vegetables, and grains that are necessary for everyday life. Despite their important role, farmers often face many challenges related to selling their products in the market.

One of the major challenges is the dependence on intermediaries or middlemen. In traditional systems, farmers sell their produce to traders who then pass it through several levels before it reaches the final

customer. These intermediaries increase the price of products and reduce the profit that farmers receive. As a result, farmers earn less income while customers end up paying more money for the same products.

Another important issue is the lack of direct communication between farmers and consumers. Farmers are often unaware of current market demand and price trends. At the same time, customers do not have complete information about where the products come from or how they are produced. This lack of transparency creates problems such as unfair pricing, delays in delivery, and reduced trust between both sides.

In recent years, the use of smartphones and internet services has increased rapidly. This has opened new opportunities to solve these problems using digital technology. Mobile applications can be used to connect farmers directly with customers, allowing them to sell products without depending on middlemen. These applications provide features such as product listing, order management, and real-time communication.

In this paper, we propose Agri-Connect, a mobile-based platform that enables direct interaction between farmers and customers. The application allows farmers to upload their products, update prices, and manage orders easily. Customers can view available products, select items, and place orders through a simple interface. The system is developed using Flutter for the front end and Firebase for the backend. The main aim of this system is to create a transparent, efficient, and user-friendly marketplace that benefits both farmers and customers.

II. LITERATURE REVIEW

The advancement of digital technologies has significantly transformed various sectors, including agriculture. In recent years, researchers have explored the use of mobile applications, cloud computing, and digital marketplaces to improve agricultural marketing systems and strengthen the connection between farmers and consumers. These technological solutions aim to reduce inefficiencies in traditional supply chains and provide farmers with better market access.

Several studies have emphasized the importance of mobile-based agricultural platforms in enabling farmers to directly sell their produce to consumers. A mobile application proposed in [1] demonstrates how digital platforms can allow farmers to list agricultural products online and reach a wider customer base. The study highlights that such systems reduce farmers' dependency on intermediaries and increase transparency in the agricultural marketing process. By providing farmers with a digital platform for product listing and order management, the system improves farmers' access to markets and enhances their income opportunities.

Similarly, research presented in [4] proposed a mobile marketplace system that connects farmers directly with customers using smartphone applications integrated with cloud-based infrastructure. The system enables farmers to upload product details such as crop type, quantity, and price while allowing customers to browse available products and place orders through the application. The study demonstrated that mobile-based marketplace platforms can effectively reduce the gap between farmers and consumers while improving the efficiency of agricultural supply chains.

Digital agricultural platforms also provide features that improve the management and distribution of agricultural products. According to [7], mobile applications designed for agricultural markets allow farmers to manage product listings, update prices, and communicate directly with customers. These systems enable real-time product availability updates, which helps customers make informed purchasing decisions. Additionally, farmers can control pricing and inventory through digital platforms, thereby improving profit margins and reducing post-harvest losses.

Cloud computing technologies play a significant role in modern agricultural applications. Research discussed in [15] highlights the importance of cloud-based systems for storing and managing agricultural data. Cloud platforms provide scalable infrastructure for storing product information, customer orders, and transaction records. They also support real-time data synchronization between users, which is essential for managing digital agricultural marketplaces efficiently. The integration of cloud services with mobile applications enables reliable data storage and efficient communication between different components of the system.

Furthermore, the development of modern cross-platform mobile frameworks has simplified the implementation of agricultural mobile applications. Frameworks such as Flutter allow developers to

build applications that run on multiple operating systems, including Android and iOS, using a single codebase. Overall, existing research highlights that digital platforms and mobile applications have the potential to transform traditional agricultural supply chains into more efficient and transparent systems. Building upon these concepts, the proposed Farmers Veggies platform introduces a mobile-based marketplace that allows farmers to directly sell vegetables to customers while ensuring real-time order management and efficient product distribution.

III. SYSTEM ARCHITECTURE

The architecture of the proposed Farmers Veggies platform is designed to enable efficient interaction between farmers and customers through a mobile application supported by cloud-based backend services. The system architecture consists of three major components: the mobile application layer, the cloud backend infrastructure, and the user modules. These components work together to provide a scalable and reliable platform for direct farmer-to-customer vegetable selling.

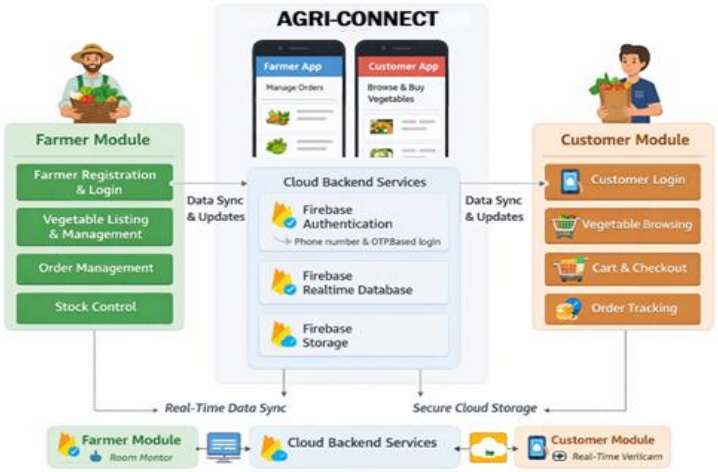

Fig 1: System Architecture Diagram

A. Mobile Application Layer

The mobile application layer serves as the primary interface between users and the system. The application is developed using the Flutter framework, which is an open-source cross-platform development framework that enables developers to build applications for multiple operating systems using a single codebase. Flutter provides a responsive user interface and high performance, making it suitable for mobile-based agricultural applications. The mobile application is designed with two different user interfaces: one for farmers and another for customers, with functionalities tailored to the specific needs of each user type.

B. Cloud Backend Infrastructure

The backend infrastructure of the system is implemented using Firebase cloud services, which provide secure authentication, real-time database management, and scalable cloud storage capabilities. Firebase Authentication implements secure login through mobile phone number verification using OTP. The Firebase Realtime Database stores and manages application data, including vegetable details, user information, and customer orders, supporting real-time data synchronization between farmers and customers. Firebase Storage handles vegetable images uploaded by farmers.

C. User Modules

The system consists of two primary user modules: the Farmer Module and the Customer Module. The Farmer Module enables farmers to manage vegetable products, respond to customer orders, and control stock availability. The Customer Module provides functionalities that allow customers to browse and purchase vegetables directly from farmers. Real-time data synchronization between both modules is

achieved using the Firebase Realtime Database, which enables instant updates across the system. Whenever a farmer updates vegetable details or accepts an order, the changes are immediately reflected in the customer interface.

IV. SYSTEM IMPLEMENTATION

The implementation of the proposed Farmers Veggies platform focuses on developing a mobile-based digital marketplace that enables direct communication and transactions between farmers and customers. The system is implemented using the Flutter framework for mobile application development and Firebase cloud services for backend functionality. Flutter enables the development of high-performance cross-platform applications, while cloud-based backend services support scalable data management and real-time system operations [16]. The implementation is divided into two major modules: the Farmer Module and the Customer Module.

A. Farmer Module Implementation

The farmer module is designed to allow farmers to manage vegetable products and handle customer orders through the mobile application. The module begins with a registration and authentication process, where farmers log in to the system using Firebase Phone Authentication. This mechanism sends a one-time password (OTP) to the farmer's registered mobile number to ensure secure and reliable access to the platform. After successful authentication, farmers gain access to a dashboard interface where they can add new vegetables to the marketplace by providing details such as vegetable name, price, quantity, and image.

The vegetable image is uploaded and stored in Firebase Storage, which provides secure cloud storage for multimedia files, while the remaining vegetable details are stored in the Firebase Realtime Database. Farmers can also update or modify vegetable details whenever necessary to maintain accurate product information. In addition, a stock management feature allows farmers to enable or disable vegetable availability using a stock ON/OFF option. When a customer places an order, the order details are stored in the database and displayed in the farmer dashboard in real time, allowing farmers to review and accept or reject incoming orders.

B. Customer Module Implementation

The customer module allows customers to browse vegetables and place orders directly through the mobile application. After launching the application, customers log in using mobile number verification through OTP authentication. Once authenticated, the application retrieves available vegetable listings from the Firebase Realtime Database, displaying vegetable name, price, quantity, and images uploaded by farmers. Customers can select vegetables and add them to a shopping cart, review selected items, and proceed to the checkout process by providing delivery details such as the delivery address.

When the order is confirmed, the order information is stored in the database with the status marked as Pending. The order is immediately visible in the farmer dashboard. Once the farmer accepts the order, the order status changes from Pending to Accepted, and after successful delivery, the status is updated to Delivered [14]. The system ensures real-time synchronization of order updates, allowing both farmers and customers to view updated order statuses instantly. Real-time data management is an important feature of modern agricultural digital platforms that improves operational efficiency and transparency [17].

V. RESULTS AND DISCUSSION

The developed system was tested to evaluate the functionality and performance of the mobile application. Various test cases were executed including farmer registration, vegetable listing, order placement, and order tracking. The results show that farmers can successfully upload vegetable information and manage their inventory using the application. Customers are able to browse available vegetables, add items to their cart, and place orders through a simple and intuitive interface.

The use of Firebase Realtime Database ensures that order updates are synchronized instantly between farmers and customers. This real-time synchronization improves communication and reduces delays in order processing. The system also demonstrates the advantages of digital agricultural platforms in improving transparency and efficiency in the vegetable supply chain. Farmers gain better control over pricing and inventory management, while customers benefit from fresh vegetables and reduced costs.

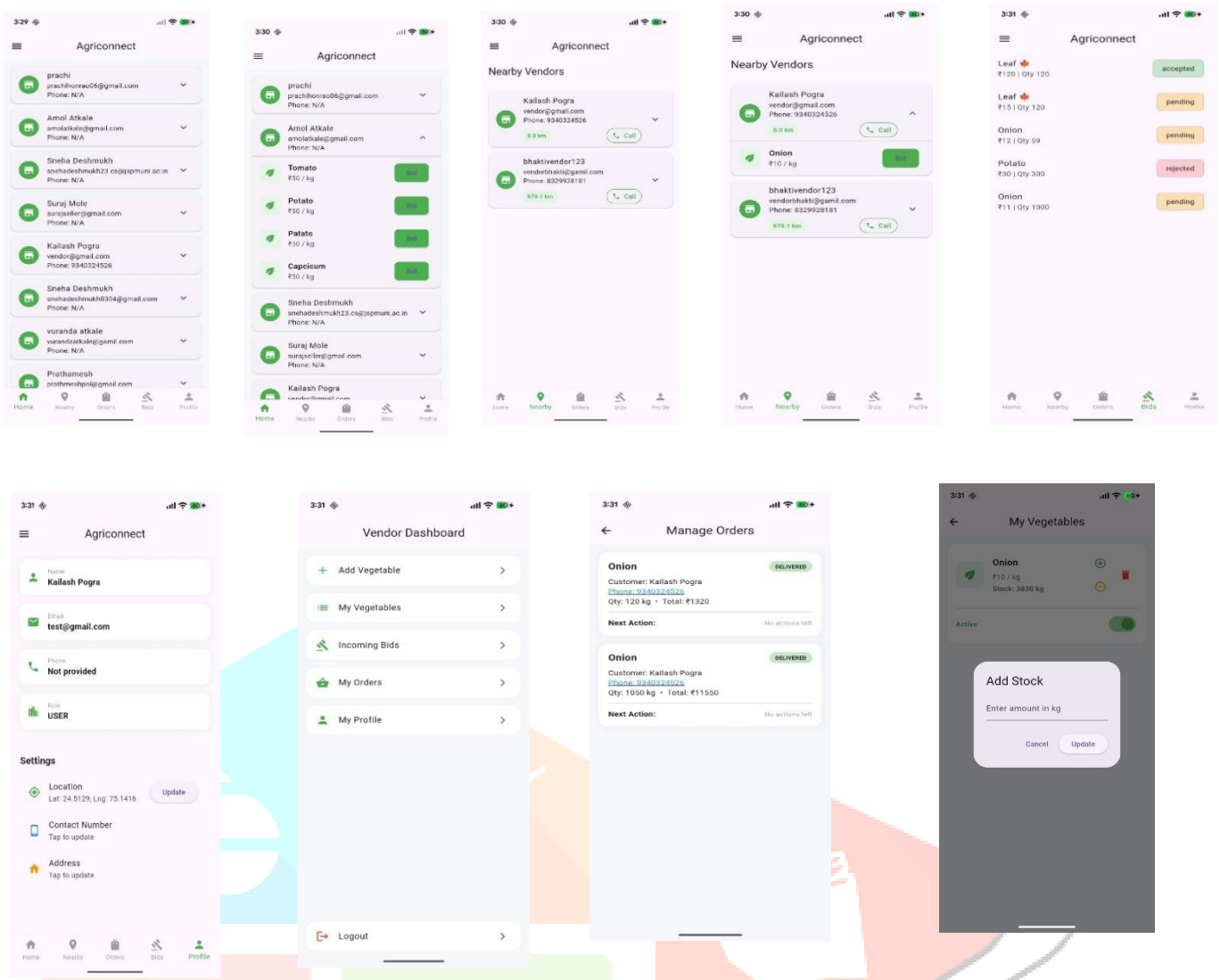

Fig 2: Application Screenshots Demonstrating System Functionality

VI. CONCLUSION

The Agri-Connect system provides a practical solution to the problems faced in traditional agricultural marketing. Farmers often struggle to sell their products at fair prices due to the involvement of middlemen. This system helps in removing unnecessary intermediaries and creates a direct connection between farmers and customers. As a result, farmers can earn better profits while customers can purchase products at reasonable prices.

The application is designed to be simple and easy to use for both farmers and customers. Farmers can add product details, manage inventory, and respond to orders using the mobile application. Customers can browse available products, add items to their cart, and place orders without difficulty. The use of Flutter ensures smooth performance of the application, while Firebase provides secure data storage and real-time updates.

The system also improves transparency in the agricultural supply chain. Customers can directly interact with farmers, which helps build trust and ensures better product quality. Real-time updates allow both users to stay informed about product availability and order status, making the system more efficient.

Overall, Agri-Connect is a useful platform that supports digital transformation in agriculture. It helps in reducing costs, improving communication, and increasing the income of farmers. The system can be further improved by adding features such as online payment options, delivery tracking, and multi-language support. With these improvements, the platform can be expanded and used by a larger number of users in different regions.

VII. FUTURE WORK

Although the proposed system successfully implements a digital platform for direct farmer-to-customer vegetable selling, several enhancements can be introduced in the future to improve the functionality, scalability, and overall efficiency of the system. One of the major improvements is the integration of online payment systems, such as Unified Payments Interface (UPI), debit or credit cards, and digital wallets. The inclusion of secure digital payment gateways will allow customers to complete transactions directly through the application.

Another important enhancement is the development of a delivery partner module that can manage the logistics and delivery of vegetables from farmers to customers. This module can help track delivery status, assign delivery personnel, and ensure timely order fulfillment. In addition, an admin dashboard can be implemented to monitor system activities and manage users. Future versions of the system can also include a farmer verification mechanism and customer rating system to increase trust and reliability within the platform. Furthermore, the application can be expanded to support multiple languages and different geographic regions, allowing farmers and customers from diverse locations to use the platform easily.

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