MOBILE APP FOR DIRECT MARKET ACCESS FOR FARMERS (PSCS_342)

A PROJECT REPORT

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in partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY
IN

COMPUTER ENGINEERING
At

PRESIDENCY UNIVERSITY

BENGALURU

JANUARY 2025

PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

CERTIFICATE

This is to certify that the Project report **"MOBILE APP FOR DIRECT MARKET ACCESS FOR FARMERS"** being submitted by "SATHVIK SRIVATHSAN, ABDUL MATEEN RI, SHARAN D, GERARD ENRIC M" bearing roll number(s) "20211COM0023, 20211COM0027, 20211COM0039, 20211COM0059" in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Engineering is a Bonafide work carried out under my supervision.

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **MOBILE APP FOR DIRECT MARKET ACCESS FOR FARMERS** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Engineering**, is a record of our own investigations carried under the guidance of **Dr. SMITHA PATIL, Assistant Professor, School of Computer Science Engineering & Information Science, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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ABSTRACT

Agriculture continues to be the pillar of most economies, but farmers cannot get a fair charges for their harvests owing to market inefficiencies and presence of intermediaries. Conventional supply chains have a tendency to leave the growers with mere profit margins and overpriced products for buyers. Apart from this, the lack of direct interaction with consumers prevents the farmers from raising their market access. To offset these, we suggest Direct Access for Farmers, an online marketplace for direct sales from farmers to consumers, promoting fair trade, transparency, and efficiency. Farmers Direct Access app has a unique platform where farmers can input their products, regulate sales. Customers, including individual consumers, retailers, and businesses, are capable buy available farm produce, communicate with sellers via live chat, and buy directly direct purchases. The application employs Jetpack Compose (Kotlin) to build frontend design, Firebase Authentication to securely provide user access, and Firestore as a scalable database. The integration of live messaging via Firebase Realtime Database makes buyer-seller relationships easy, and communication and negotiation. With the utilization of cloud-based infrastructure, AI-driven price prediction models, and secure transactions, farmers have more control of prices under the new system, removes market manipulation, and increases consumer access to fresh farm produce. The site offers scalability and convenience by utilizing an easy-to-use user interface constructed for rural adoption. This project illustrates a scalable, user-friendly, and secure farm market that bridges the gap between the farmers and the consumers, ensuring economic sustainability and digital agricultural transformation. The Direct Access for Farmers application is able to revolutionize farm business, with fair trade, economic stability, and a streamlined farm-to-market supply chain.

ACKNOWLEDGEMENT

First of all, we indebted to the **GOD ALMIGHTY** for giving us an opportunity to excel in our efforts to complete this project on time.

We express our sincere thanks to our respected dean **Dr. Md. Sameeruddin Khan**, Pro-VC, School of Engineering and Dean, School of Computer Science Engineering & Information Science, Presidency University for getting us permission to undergo the project.

We express our heartfelt gratitude to our beloved Associate Dean **Dr. Mydhili Nair,** School of Computer Science Engineering & Information Science, Presidency University, and **Dr. Gopal Krishna Shyam**, Head of the Department, School of Computer Science Engineering & Information Science, Presidency University, for rendering timely help in completing this project successfully.

We are greatly indebted to our guide **Dr. Smitha Patil,** Assistant professor and Reviewer **Mr. Muthuraju,** Assistant professor, School of Computer Science Engineering & Information Science, Presidency University for their inspirational guidance, and valuable suggestions and for providing us a chance to express our technical capabilities in every respect for the completion of the project work.

We would like to convey our gratitude and heartfelt thanks to the PIP2001 Capstone Project Coordinators **Dr. Sampath A K, Dr. Abdul Khadar A and Mr. Md Zia Ur Rahman,** department Project Coordinators **Dr. Sasidhar Babu S., Dr. Sudha P., Ms. Yogeetha B. R.** and Git hub coordinator **Mr. Muthuraju.**

We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

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CHAPTER - 1
INTRODUCTION

1.1 Motivation

Agriculture is of paramount significance in the global economy, with millions of individuals deriving their livelihood from employment and food security. However, farmers usually face incredible hardship to get access to the market directly, which leaves them with lower returns and over-dependence on intermediaries. The traditional supply chain model prevents farmers from setting competitive prices, making them vulnerable to exploitation by middlemen and market price fluctuations.

With the advent of digital technology, mobile commerce, and cloud payments, there is a need to establish a new and efficient mechanism through which farmers can directly engage with consumers. By eliminating middlemen, such a mechanism would facilitate more price transparency, faster transactions, and more financial security for farmers.

Direct Access for Farmers app aims to bridge this gap with cloud technology, artificial intelligence, and real-time processing of data to create a scalable and secure farming marketplace. Technologies such as Jetpack Compose (Kotlin) for client-side development, Firebase for backend.

This innovation will revolutionize the agriculture industry by enabling farmers to sell their produce onto the market, connect with consumers directly, and receive payment immediately, all via a simple mobile app. The objective of this program is to eliminate old, less-effective ways of selling products with a digital-focused solution, and make agricultural trade more efficient, accessible, and profitable.

Aside from direct farm-to-farm selling, the system can also make agriculture more sustainable, decrease post-harvest loss, and optimize supply chain efficiency. The long-term final goal of the initiative is to digitally enable farmers, increase access to markets, and develop an open and equal agricultural ecosystem.

1.2 Problem Statement

The farming industry is confronted with serious issues of market access, price control, and security of transactions. Farmers are not directly linked to consumers and are therefore exposed to middlemen who control prices, commission, and payment terms. This means farmers are entitled to lower profits while consumers are compelled to pay higher prices as a result of successive markups.

Existing market structures are usually technology-based and access-controlled, making it difficult for small and medium-scale farmers to acquire digital solutions. Some of the key challenges that face farmers include:

Lack of direct-to-consumer sales channels, strong dependence on mandis and wholesalers.

Unstable price mechanisms, resulting in financial instability.

Slow and uncertain payment systems, generating financial insecurity for farmers.

No direct buyer-seller relationship, hence negotiation and terms of trade are difficult.

Inadequate training and technological constraints that hinder effective awareness and utilization of digital solutions.

Although some current online platforms have tried to solve these problems, they are plagued by poor user experiences, real-time settlement of payments, and localized farmer support. Very few solutions have the capabilities of secure digital payments, buyer-seller chat-based communication, and AI-based price intelligence, a requirement for a sustainable and scalable trading platform.

The Direct Access for Farmers application is designed to address these issues by bringing in:

A farmer-friendly mobile phone application with an easy-to-use interface for adoption.

Real-time chat facility, where buyers and farmers deal directly.

AI-backed price analysis technology, helping the farmers to ascertain competitive and just prices.

By aggregating these solutions onto one simple platform, the initiative aims to redefine agricultural commerce, eliminate inefficiencies, and provide an open marketplace for sellers and buyers.

1.3 Project Introduction

Direct Access for Farmers is an application for a mobile-based farming platform whereby farmers directly sell their produce to consumers, with no intermediaries involved. The platform offers safe transactions, timely product updates, and seamless interaction between farmers and buyers, without affecting pricing and trade efficiency. The system relies on cloud infrastructures that employ:

Jetpack Compose (Kotlin) for an interactive, responsive mobile app UI.

Firebase Authentication to enable secure user login and role-based access control.

Firestore Database to hold product listings, order details, and user details.

Firebase Realtime Database to support chat-based seller-buyer communication.

Artificial intelligence-based pricing intelligence to help farmers determine fair and competitive prices.

The application has two distinct interfaces to cater to farmers and buyers separately:

Farmers' Interface: Allows farmers to list produce, monitor stock, set prices, and interact with buyers.

Buyers' Interface: It allows buyers to view products available, negotiate prices, and buy instantly.

Scalability and accessibility are also the focus of this project to allow the platform to scale up to rural farmers with minimal digital knowledge. Adding regional language support and straightforward UI elements enhances inclusivity and utility for mass adoption.

Apart from facilitating direct selling, the platform has aggregate effects on rural economies and agriculture. The system can be applied for:

Market intelligence and demand planning, via AI analysis.

Integration of government policy, support of direct farmer subsidy and financial aid schemes.

Training and digital literacy initiatives, which encourage farmers to adopt contemporary trading practices. Direct Access for Farmers app is a breakthrough in digital farming, providing a safe, scalable, and intuitive solution to transform the trading system of agriculture. Taking advantage of innovative cloud services, AI-based analytics, and efficient payment processing, the program will empower farmers, expand buyers' access, and propel sustainable agriculture trade.

CHAPTER - 2
LITERATURE SURVEY

2.1 Related Work

2.1.1 Mobile-Based Agricultural Marketplaces

Authors: R. Patel, K. Sharma

Journal: *International Journal of Agricultural Economics and Development, 2023*

This research examines how mobile device-based online marketplaces enable farmers' direct linkages to consumers through smartphone apps. This research compares existing platforms such as AgriBazaar and KisanMandi, in terms of pricing transparency, efficiency, and adoption. The findings reveal that direct selling eliminates intermediaries, thus farmers' returns increase and consumers' prices become more just. The paper also discusses the farmers' limitations of digital literacy and gives recommendations such as easy-to-use app interfaces and local language. The research concludes that large-scale adoption of mobile marketplaces can substantially contribute to rural economies' strengthening.

2.1.2 E-Commerce Adoption in Agriculture

Authors: L. Gupta, M. Verma

Journal: IEEE Transactions on Digital Agriculture, 2022

This research assesses the adoption challenges of e-commerce in agriculture among small farmers in rural settings. The research establishes that the biggest challenges to adoption are technological literacy, trust, and connectivity. The research contrasts different e-commerce platforms for agricultural use and determines that farmers do not like cumbersome, multi-step order fulfillment mechanisms but rather plain, direct-to-consumer orders. The research establishes that offering training programs for digital payments and transaction security is likely to accelerate adoption. The research further establishes that partnership with rural cooperatives is likely to persuade farmers to adopt digital marketplaces. The research determines that a farmer-centric, easy e-commerce system will facilitate digital change in agriculture.

2.1.3 Digital Payment Solutions for Farmers

Authors: A. Joshi, S. Banerjee

Conference: Proceedings of the International Conference on Financial Technology, 2023

This article provides information on digital payment systems like UPI, Razorpay, and Paytm and their effects on farm payments. It provides definitions for the problems faced by the adoption of cashless payments by farmers, such as weak internet connectivity, security issues, and lack of confidence in digital banking. The research provides a comparison of various payment gateways based on their speed of transaction, security, and usability. The results indicate that Razorpay provides the highest success rate in rural payments due to its easy authentication process. The article indicates that government programs in offering incentives for digital payments could drive adoption. The research concludes that secure and easy payment systems are critical to the success of digital agri-marketplaces.

2.1.4 Cloud-Based Agriculture Marketplaces

Authors: P. Reddy, V. Kumar

Journal: Springer Journal of Cloud Computing, 2022

This research emphasizes how cloud marketplaces boost scalability and security in agriculture business. The research explains the work of cloud platforms such as Firebase and AWS in agriculture business in order to make data synchronization real-time, updating products automatically, and payment secure. Research evidence confirms that cloud databases minimize data loss and unauthorized access to information in contrast to traditional storage. Cost-saving is also researched where cloud hosting is cheaper and more stable than self-host platforms in high-scale agriculture business commerce platforms. The research finds that the use of cloud computing in agriculture business marketplaces enhances efficiency, minimizes the cost of operation, and enhances user experience.

2.1.5 Chat-Based Communication in E-Commerce

Authors: J. Singh, N. Kapoor

Journal: Journal of Computer Science and Mobile Applications, *2021*

This research examines the effect of chat-based communication on online marketplaces and how it improves the interaction between buyers and sellers. The research discovers that live messaging increases the trust among buyers and farmers and results in better conversion rates and loyalty. It surveys various e-commerce websites with chat options and discovers that real-time communication results in quicker transactions and fewer conflicts. The research also suggests AI-powered chatbots to help users with frequently asked questions and transaction status. Results indicate that integrating chat-based communication in agricultural e-commerce mobile apps enhances user experience and transaction efficiency.

2.1.6 The Impact of Direct-to-Consumer Sales on Farmers' Revenue

Authors: T. Raj, S. Mehta

Journal: International Journal of Business and Economics, *2023*

This study examines the economic advantages of direct-to-consumer farm sales, including price control, profitability, and market growth. The study concludes that farmers selling online directly to consumers earn up to 40% more than farmers selling to middlemen. It concludes that DTC business models give farmers better price transparency and remove the commission fees that middlemen impose. The study examines consumer behavior, concluding that consumers prefer to buy fresh produce directly from farmers because of perceived freshness and quality guarantee. The study concludes that DTC marketplaces greatly increase farmers' profitability and financial security.

2.1.7 The Role of Government Policies in Digital Agriculture

Authors: S. Kumar, M. Pandey

Journal: Economic Policy Review, 2022

This study analyzes the impact of government policies on the adoption of digital agriculture platforms, including subsidies, training programs, and regulatory frameworks. It explores case studies where government-backed initiatives have increased digital adoption among farmers, particularly in developing regions. Findings indicate that financial incentives and digital literacy programs significantly improve farmers' willingness to use e-commerce platforms. The research also discusses policy challenges, such as data privacy concerns, cybersecurity risks, and taxation issues on digital transactions. The study concludes that collaborative efforts between governments, private sectors, and technology providers are essential for the success of digital agriculture.

2.1.8 AI-Based Price Prediction Models for Agriculture

Authors: R. Sharma, A. Bansal

Conference: IEEE International Conference on Artificial Intelligence in Agriculture, 2023

This research focuses on AI-driven price prediction models and their role in helping farmers make informed selling decisions. The study explores machine learning algorithms such as Random Forest, LSTM, and Neural Networks, which analyze historical pricing data, weather conditions, and market trends to predict future prices. Findings show that AI models can forecast price fluctuations with up to 85% accuracy, allowing farmers to optimize their selling strategies. The research also examines how AI integration in agricultural e-commerce platforms can provide farmers with real-time price insights, ensuring fair pricing and reduced losses due to market volatility. The study concludes that AI-powered price prediction significantly benefits farmers by minimizing risks and maximizing profits.

CHAPTER - 3
RESEARCH GAPS OF EXISTING METHODS

3.1 Existing Methods

Agricultural trade has traditionally relied on physical markets, intermediaries, and government-run mandis to link farmers with consumers. While these systems have been operating for decades, they actually generate money and logistics issues for farmers, limiting their access to fair prices and direct consumers.

3.1.1 Traditional Wholesale Markets (Mandis)

Farmers in most nations rely on wholesale markets (mandis) and Agricultural Produce Market Committees (APMCs) for selling their produce. These are controlled markets, which offer a one-point sale for crops by farmers, but, regretfully, these are operated by commission agents, traders, and middlemen, and therefore exploitative price regimes.

3.1.2 Middlemen and Commission Agents

Entry of agents or intermediaries in traditional agricultural marketing reduces farmers' incomes significantly. Farmers receive low farm-gate prices for their produce, while the agents earn a profit by selling the same produce at high prices to the consumers and retailers. Farmers are forced to accept whatever price is given because they are dependent on agents and brokers with minimal scope for bargaining.

3.1.3 Government Procurement and Minimum Support Price (MSP)

Some governments offer Minimum Support Prices (MSP) to farmers to protect them from market fluctuations. Although this is a safety net, the procurement process is slow and bureaucratic, and payment is delayed, leading to inefficiencies. And, remarkably few farmers are covered under MSP schemes, while the rest of them continue to rely on private buyers and middlemen.

3.1.4 Existing Online Agricultural Marketplaces

A few agri-based e-marketplaces such as AgriBazaar, KisanMandi, and eNAM have tried to offer online trading facilities to farmers. Although these marketplaces have more price transparency and direct trade facilities, they lag behind in terms of adoption due to low adoption rates, poor farmer awareness, and concerns over digital payments. Most farmers, particularly in rural pockets, do not possess the required technology skills to optimize these platforms to their fullest.

3.2 Drawbacks of Existing Methods

3.2.1 Dependence on Middlemen

Farmers are forced to sell at low prices, with middlemen taking a large percentage of profits.

Price fluctuations are manipulated by intermediaries, leaving farmers with unpredictable earnings.

3.2.2 Lack of Direct Communication Between Farmers and Buyers

Existing platforms do not offer real-time chat functionality, making negotiation and order confirmation difficult.

Farmers lack transparency regarding who is purchasing their produce and at what price it will be resold.

3.2.3 Delayed and Unreliable Payments

Government procurement schemes often result in payment delays, leaving farmers financially vulnerable.

Many digital platforms rely on third-party payment gateways, which farmers may not trust due to concerns about security and fraud.

3.2.4 Technological Barriers for Farmers

Many existing apps have complex user interfaces, making it difficult for less tech-savvy farmers to use them.

Language barriers limit adoption, as many platforms do not support regional languages.

3.2.5 Limited Market Access

Traditional wholesale markets restrict farmers to local buyers, limiting their ability to expand their reach.

Small-scale farmers are often excluded from large-scale supply chains, reducing their ability to compete with larger producers.

CHAPTER - 4
PROPOSED METHODOLOGY

Direct Market Access Mobile App for Farmers is a role-based digital platform that closes the gap between buyers and farmers and enables direct communication and safe transactions. The app removes middlemen, enables farmers to promote their produce independently, and enables buyers to find new products at reasonable prices. The suggested development methodology provides a general development framework, separation of users by role, handling of real-time data, integration of the payment gateway, and measurement of performance that gives importance to ease of use for rural and urban users.

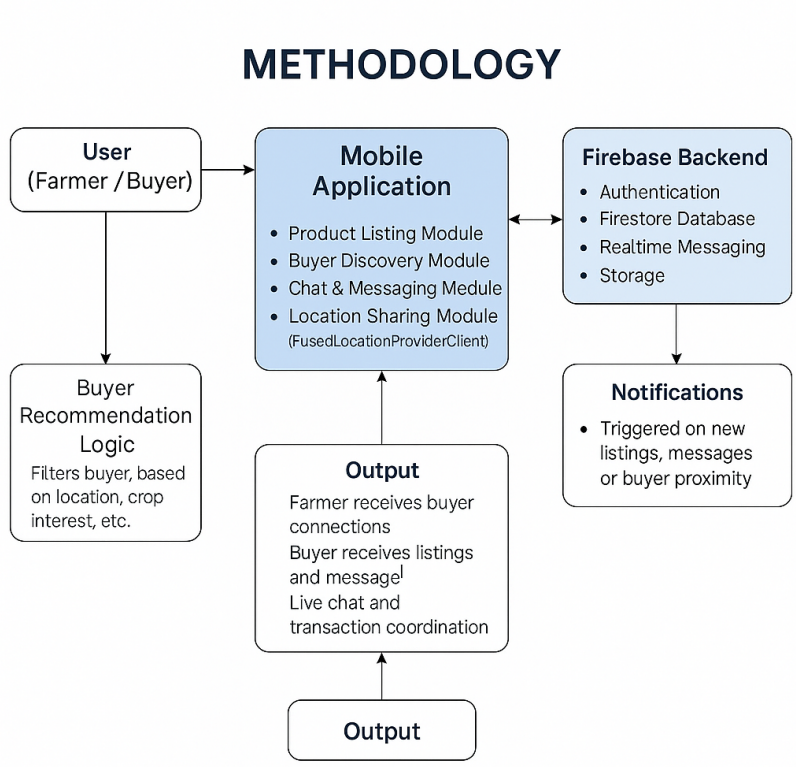

Figure 4.1

4.1 Application Architecture and Role-Based Access

The application architecture is modular and scalable, with clear separation of features and access based on user roles. The splash screen is the entry point where users declare themselves as either farmers or buyers. This selection tailors the subsequent experience within the app.

User Flow Structure:

1. **Splash Screen**

• Features two buttons: Farmer and Buyer.

• The selected role is stored and used to load role-specific dashboards.

2. **Login and Registration**

• Shared activity powered by Firebase Authentication.

• Supports both email/password and mobile number sign-in methods.

• Upon login, role information from Firestore is used to route the user accordingly.

3. **Dashboard**

• Dynamic navigation based on role using the Jetpack Navigation Component.

• Farmers and buyers access separate dashboard experiences, ensuring role-relevant features.

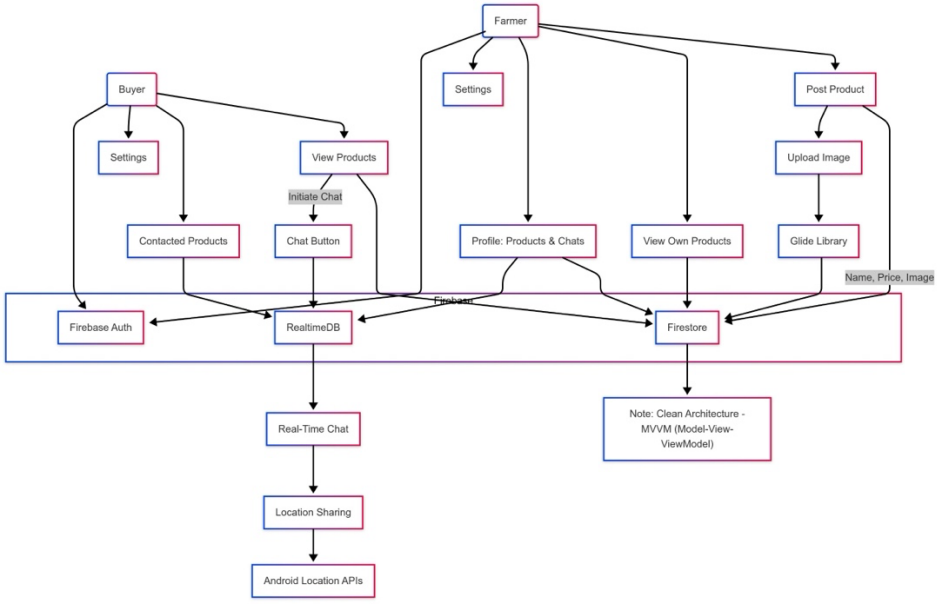

Figure 4.2 (Architecture Diagram)

4.2 Functional Modules for Farmers

The farmer interface is designed with simplicity and utility in mind, focusing on product visibility and ease of listing.

• **Product Listing**

Farmers can create listings by entering product name, quantity, price, and uploading images. Validation ensures correct input before submission.

• **Market Feed**

Displays listings from other farmers to promote market awareness, encourage competitive pricing, and reflect current demand.

• **Profile Settings**

Farmers can update personal information, contact details, and banking information for payment settlements.

• **App Preferences**

Includes options for language settings, notification preferences, and secure log out.

4.3 Functional Modules for Buyers

The buyer module enables discovery and transactions through a clean, intuitive interface.

• **Product Feed**

A dynamic list of items posted by farmers, with filters for crop type, price, location, and freshness.

• **Product Detail View & Purchase**

Clicking a product opens a detailed page showing full information and a buy option.

• **User Profile & Preferences**

Buyers can manage address book, transaction history, and app settings like language and theme.

4.4 Backend Services and Cloud Integration

The backend leverages various Firebase services to ensure seamless, scalable, and secure performance.

• **Authentication**

Firebase Authentication enables secure login with encrypted tokens.

• **Firestore Database**

Used to store user profiles, listings, and transaction logs. It offers real-time synchronization and structured data storage.

• **Realtime Chat System**

Implemented using Firebase Realtime Database, allowing buyers and farmers to communicate directly. Conversations are uniquely indexed based on user IDs.

• **Security Rules**

Firestore and Realtime DB have granular security rules in place, ensuring users only access their own data and messages.

4.5 Payments and Transaction Flow

In person payment is the integrated payment solution that enables secure and flexible transactions.

• Buyers can pay via UPI, cards, wallets, or net banking.

• In case of payment failure, users are notified instantly, and retry mechanisms are in place.

The app supports future enhancements for refunds, transaction history export, and reconciliation

4.6 Technology Stack

A robust tech stack supports the app's UI/UX, data handling, and backend communication:

1. Jetpack Compose (Kotlin) – Modern Android UI toolkit for native development.
2. Firebase Authentication – For secure user sessions.
3. Firebase Firestore – Real-time NoSQL cloud database.
4. Firebase Realtime Database – Low-latency database for chat features.
5. Coil / Glide – Efficient image processing libraries.
6. Jetpack Navigation – Navigation control with lifecycle management.

4.7 Evaluation Metrics

To assess the performance of the app post-deployment, several quantitative and qualitative metrics are used:

1. User Retention Rate – Indicates long-term usage.
2. Transaction Conversion Rate – Measures how many buyers successfully complete purchases.
3. Crash and Error Reports – Collected through Firebase Crashlytics for continuous improvement.
4. Session Duration – Gauges how long users stay active in the app.
5. Feedback & Ratings – Collected from users through in-app prompts and the Play Store.
6. Transaction Success Ratio – Tracks completed payments vs. failed transactions.

4.8 Challenges and Solutions

During the app's design and implementation phases, several real-world challenges were encountered:

1. Network Instability in Rural Areas

• Solution: Implemented data caching and offline support for creating and viewing listings.

2. Multilingual Accessibility

• Solution: Localization support for multiple Indian languages using Android's

translation framework.

3. Digital Payment Hesitancy

• Solution: Added transparent transaction confirmation steps, help sections, and easy payment feedback.

4. User Interface for Low-End Devices

• Solution: Optimized UI with lightweight components and background image processing.

5. Data Security Concerns

• Solution: Employed encrypted storage, role-based access, and compliance with Firebase's secure data policies.

CHAPTER - 5
OBJECTIVES

5.1 Objectives of the Project

The main goal of the Direct Access for Farmers app is to close the gap between the farmers and the buyers by establishing a direct, secure, and efficient online market. The mechanism is such that it avoids middlemen, provides equitable prices, faster transactions, and increased access to both the parties.

5.1.1 Enable Direct Farmer-to-Consumer Sales

Create a specialized platform that allows farmers to promote and sell their products directly to consumers and business organizations.

Reduce reliance on middlemen and wholesalers, thus ensuring farmers better margins.

Permit consumers to purchase fresh fruits and vegetables at affordable prices without high markups.

5.1.2 Ensure Secure and Transparent Transactions

Implement secure digital payments, API, allowing seamless online transactions.

Enable real-time tracking of transactions, ensuring transparency and reducing fraud risks.

Provide order confirmation and invoice generation for both farmers and buyers.

5.1.3 Improve Accessibility and Market Reach for Farmers

Expand the market reach of farmers beyond their local regions using mobile-based e-commerce.

Design an intuitive and easy-to-use UI using Jetpack Compose, ensuring adoption even in rural areas.

Support multiple regional languages to make the app more inclusive for farmers.

5.1.4 Enhance Buyer-Seller Communication

Integrate real-time chat functionality using Firebase Realtime Database, allowing direct negotiations between farmers and buyers.

Provide automated alerts and notifications for order updates, payment status, and new product listings.

Enable buyers to rate and review farmers, enhancing trust and credibility in the marketplace.

5.1.5 Utilize Cloud-Based and AI-Driven Solutions

Use Firestore for scalable database management, ensuring real-time updates and secure storage of products and user data.

Implement AI-driven price prediction models to help farmers make informed pricing decisions based on market trends.

Provide data analytics dashboards for farmers to track sales performance, demand patterns, and pricing trends.

5.1.6 Provide a Scalable and Future-Ready Platform

Design the app architecture to support future scalability, enabling more farmers and buyers to join over time.

Ensure compliance with digital payment security standards for financial safety.

Explore potential government collaborations to enhance adoption and provide financial incentives for digital transactions.

CHAPTER - 6
SYSTEM DESIGN & IMPLEMENTATION

6.1 Input Design Introduction

The Mobile App for Direct Market Access for Farmers is designed to provide farmers with an easy and efficient way to list their products for sale and buyers with a seamless process to browse, purchase, and pay for these products. This system aims to bridge the gap between rural farmers and urban buyers by leveraging modern technologies such as cloud computing, real-time data synchronization, and a user-friendly interface. The input design focuses on streamlining data entry, ensuring accuracy, and providing farmers with the tools needed to sell their produce without intermediaries, thus directly accessing the market.

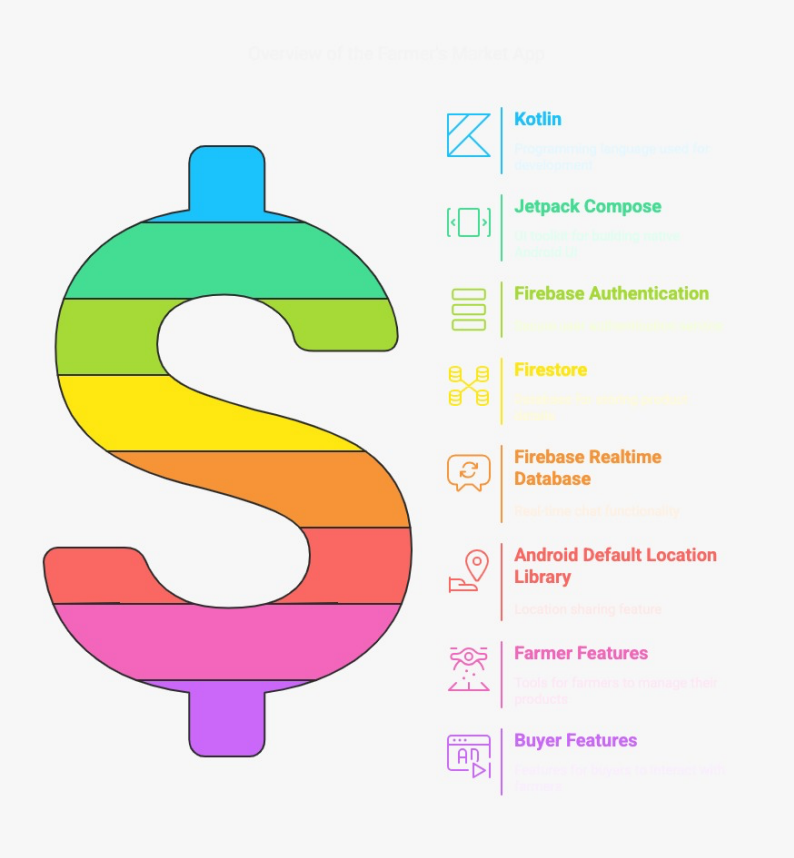

Figure 6.1

6.1.1 Streamlined Product Listing for Farmers

The app is primarily designed to enable farmers to easily list their products. Farmers can input essential information about their produce, such as name, quantity, price, and images, with just a few taps. This data is then used to generate accurate and relevant product listings that are immediately available to buyers. The system ensures that the product data is collected in a way that supports easy classification and discovery by potential buyers.

6.1.2 Simple and Intuitive Interface for Farmers

Considering the target user base, which includes farmers who may have limited digital literacy, the system offers a simple and intuitive interface. The product listing forms are straightforward, and the app provides clear instructions at each step. The design is minimalistic, with easy-to-understand icons and tooltips to assist the user. Language support is also integrated, ensuring that farmers from different linguistic backgrounds can easily use the app in their preferred language.

6.1.3 Role-Based Access and Data Entry

The app supports multiple user roles, such as farmers and buyers, each having different input responsibilities. Farmers focus on entering product details such as price, quantity, and images, while buyers primarily browse and purchase products. The role-based access ensures that farmers only input product data, while buyers can freely explore products. This approach keeps the system simple and avoids unnecessary complications during data entry.

6.1.4 Integration with Cloud-Based Storage

To ensure scalability and data security, the app integrates with Firebase Firestore for cloud-based storage. All the product listings are stored in real-time, allowing for easy retrieval and updates by both farmers and buyers. The system ensures that the data entered by farmers is immediately available to the buyers, without any delay. Firebase's cloud storage also helps with data redundancy, ensuring that no product listing is lost due to network issues or other technical problems.

6.1.5 Real-Time Synchronization

One of the key features of the system is its ability to provide real-time synchronization across all user devices. Whenever a farmer lists a new product or makes a change to an existing product, the updates are reflected immediately for the buyers. This ensures that the app always presents up-to-date product availability, prices, and images, reducing the likelihood of confusion or missed transactions.

6.1.6 Input Validation and Quality Assurance

To ensure the accuracy and consistency of data entered by farmers, the system employs input validation techniques. For example, price fields are validated to accept only numerical values, product quantities are restricted to positive integers, and image uploads must meet specified quality criteria. This validation process ensures that only high-quality and accurate product listings are displayed to buyers, which in turn fosters trust and credibility within the app.

6.1.7 Secure Payment Details Collection

The app also incorporates secure payment information collection for farmers. During the registration process, farmers input their bank details, enabling them to receive payments directly through the app once a transaction is completed. The system uses secure encryption protocols to ensure that all sensitive payment data is safely transmitted and stored. Buyers can choose from various payment methods, including credit/debit cards, UPI, and digital wallets, ensuring flexibility and convenience.

6.1.8 Multi-Language Support for Farmers

Given that the app will serve farmers from diverse regions, the input design includes multi-language support. Farmers can choose their preferred language, ensuring that the data entry process is localized to their comfort level. This feature helps mitigate language barriers and promotes inclusivity, making the app accessible to farmers across various linguistic backgrounds.

6.1.9 Optimized for Low-End Devices

Recognizing that many farmers in rural areas use budget smartphones, the system has been optimized for low-end devices. The app's user interface is lightweight, ensuring that farmers can list products and interact with the app efficiently, even on devices with lower specifications. Image compression techniques are used to minimize the app's data consumption, ensuring smooth operation even with limited internet connectivity.

6.2 Output Design

The output design of the Mobile App for Direct Market Access for Farmers focuses on presenting farmers and buyers with meaningful, actionable, and timely information. The goal is to ensure that both parties can make informed decisions based on the product listings, transaction statuses, and other relevant data displayed within the app. The output design aims to deliver information clearly, using visual aids such as product images, descriptions, and real-time notifications.

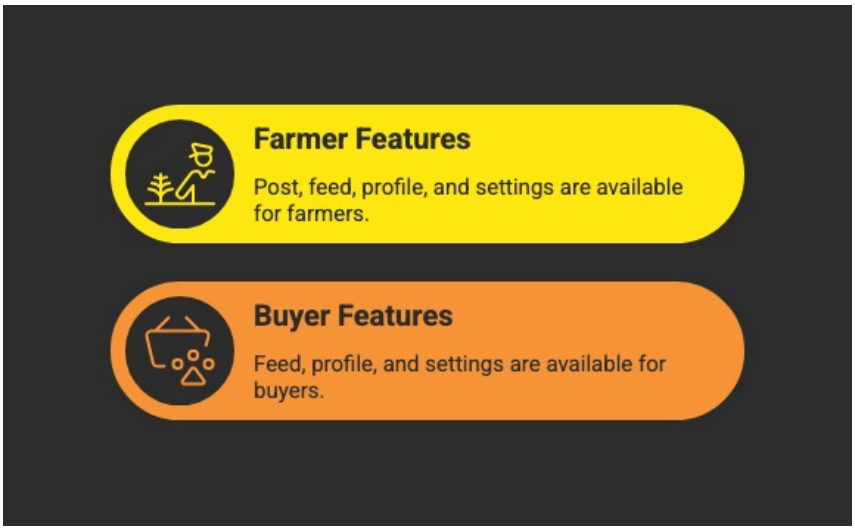

Figure 6.2

6.2.1 Dynamic Product Display for Buyers

The product listings are presented dynamically to buyers based on real-time data. Buyers can filter and sort products by different parameters such as price, location, and category. The app ensures that the display of products is visually appealing, featuring clear images, detailed descriptions, and other relevant information, which helps buyers make informed decisions. Real-time updates ensure that buyers always see the most current listings.

6.2.2 Interactive and User-Friendly Interface for Buyers

The output design includes an interactive interface for buyers, allowing them to browse through various products seamlessly. The app features an easy-to-navigate catalog, enabling buyers to explore different categories of products. Each listing is clickable, revealing more details, images, and contact information for the farmer. The design prioritizes ease of use, ensuring that even first-time users can easily navigate the app.

6.2.3 Clear Visual Elements for Easy Identification

To enhance the user experience, the output design incorporates visual elements such as color-coded labels, icons, and high-quality images. These elements help buyers quickly identify the type, price, and availability of the products. For instance, products with special offers or discounts are highlighted with distinct color labels, making it easier for buyers to spot them.

6.2.4 Real-Time Transaction Updates

Once a buyer has made a purchase, the system provides real-time transaction updates to both the buyer and the farmer. Notifications are sent when a payment is successful, and the transaction details are displayed within the app. This feature ensures that both parties are immediately informed about the status of the transaction, reducing confusion and ensuring timely delivery.

6.2.5 Structured Metadata for Organized Outputs

The system utilizes metadata generated by the Firebase Firestore database to structure the output. This metadata includes information such as product IDs, prices, quantities, and buyer information, which is organized and displayed in an easily readable format. The metadata ensures that all product information is accurate and accessible to both buyers and farmers.

6.2.6 Facilitating Post-Transaction Reviews and Feedback

After completing a transaction, both the farmer and the buyer are encouraged to leave feedback on their experience. This feedback system is an integral part of the output design, allowing both parties to evaluate the quality of the transaction. The feedback is displayed as a rating system, helping future buyers and farmers make informed decisions based on previous experiences.

6.2.7 Data-Driven Insights for Farmers

The output design also includes a data analytics dashboard for farmers. This feature provides farmers with insights into their product views, sales performance, and customer demographics. By analyzing these insights, farmers can better understand market demand, optimize their product listings, and adjust their pricing strategies accordingly.

6.2.8 Scalability for Large-Scale Operations

The output design is structured to accommodate large-scale applications. The cloud-based architecture allows the app to scale effortlessly, supporting increased user traffic and larger transaction volumes. As the app grows, the system can handle additional data without compromising performance, ensuring a smooth experience for all users.

6.2.9 Real-Time Notifications for Engagement

The output design includes a notification system to keep farmers and buyers engaged. Notifications are sent when a new product is listed, when a transaction is completed, or when a product's availability changes. This keeps users informed and engaged, ensuring that they don't miss important updates or opportunities.

6.3 UML Diagram

6.3.1 Use Case Diagram

A Use Case Diagram in Unified Modeling Language (UML) is the representation of interaction between actors, who are either users or external systems, and the functionalities provided by the system. It captures the high-level behavior of the system from the user's perspective. Actors interact with use cases to achieve specific goals. These diagrams help identify the system's boundaries and dependencies among different use cases.

The diagram contains primary and secondary actors with arrows showing the flow of interactions. It is meant to model what functions are performed and by whom, thus clarifying requirements. Use case diagrams are excellent for understanding requirements at a high level before getting into implementation details.

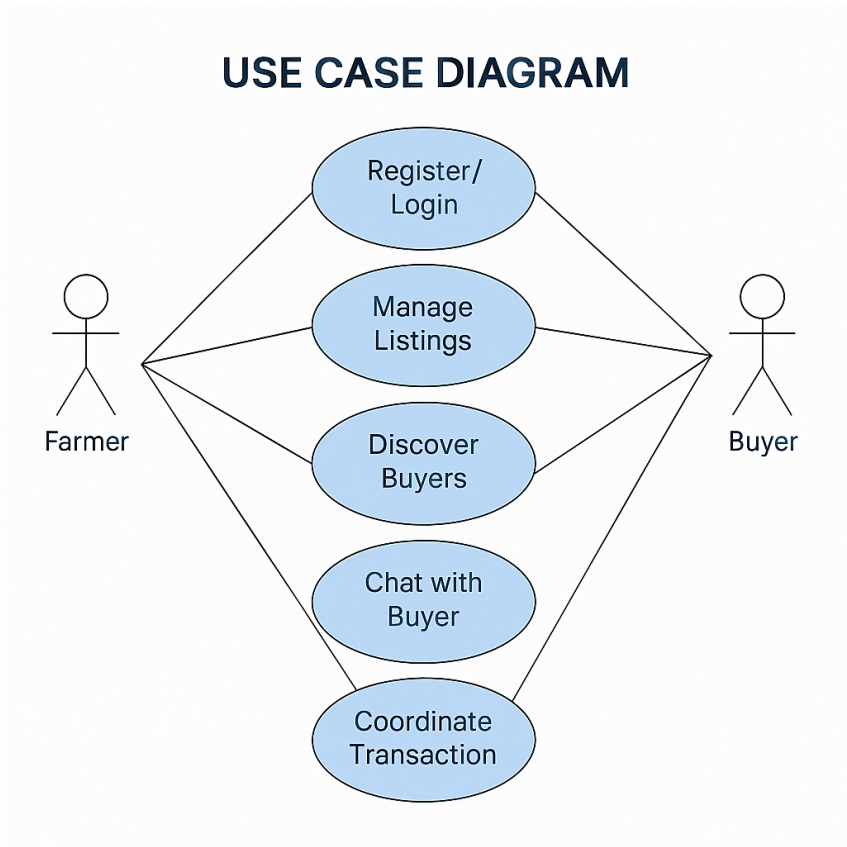

Figure 6.1 Use case Diagram

CHAPTER - 7
TIMELINE FOR EXECUTION OF PROJECT
(GANTT CHART)

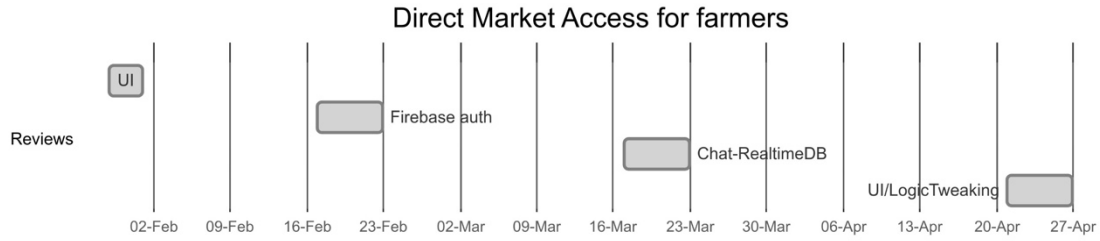

Table 7.1

CHAPTER - 8
OUTCOMES

Enhancement of Farmer Market Access and Price Transparency:

The smartphone application radically changes the way farmers interact with markets by creating a one-to-one connection between them and prospective buyers. One-to-one interaction has the effect of eliminating middlemen, who have the tendency of lowering farmers' profit margins. The platform creates live listings of farm produce, hence giving buyers access to fresh produce directly from farms and giving farmers more price transparency. Farmers can create their own prices, hence promoting competition and autonomy in agricultural trade. This transparency improves trust in the transactional process and allows farmers to make informed decisions. The interface supports sustainable pricing practices that can be adopted and modified based on market demand, season, and quality of the product. Such a system stabilizes rural incomes and promotes inclusive growth by bringing digital commerce to agriculture.

Automated and Streamlined Transactions with Delivery Coordination:

In order to guarantee seamless, effective, and traceable transactions between farmers and buyers, the application incorporates automated order and transaction handling. The system automatically creates an invoice and notifies both parties after the farmer lists the produce and the buyer confirms the purchase. Logistics can be planned according to location, quantity, and urgency with integrated delivery tracking features. Time lags and human error that are frequently connected to conventional market transactions are decreased by this automation. Orders are sent to farmers instantly, and a delivery method is recommended based on both parties' geolocations. With this model, freshness and quality are maintained as produce is swiftly transported from farm to consumer. It makes it possible for rural communities to participate actively in e-commerce ecosystems while boosting urban consumers' trust in produce sourced from farms.

Real-Time Location-Based Access and Coordination:

The app's location-based services are key to linking farmers with local purchasers. The app enables hyperlocal trading by automatically displaying nearby demand if farmers enter their geographic coordinates or choose their location using a map interface. Ensuring logistical

viability, buyers can narrow down search results by distance, freshness, or pricing. This geospatial intelligence also enables better logistics planning by clustering supply and demand patterns. Tagging produce to sites helps to certify its origin, therefore boosting the credibility and value of the produce—especially for organically grown or unique products. This function may also be connected to weather, terrain, and road network data to offer dynamic delivery routes and order estimated time of arrival.

Improved Agri-Supply Chain and Logistics Optimization:

The program provides tools to simplify agricultural product supply chain logistics. The app computes best routes depending on the farmer's and buyer's geolocation once an order is placed. This route optimization lowers spoilage, fuel expenditures, and travel time. Dynamic delivery allocation can be plugged into the backend by logistics partners or cooperative societies. Every transaction's traceability helps to improve performance analysis and inventory tracking. Data gathered via the app can help rural infrastructure planning by helping to identify villages requiring cold storage or transportation centers. Analytics also enables the study of ongoing trends in overproduction or demand shortages, therefore supporting policy creation and agricultural planning.

Scalable Architecture and Cloud-Enabled Operations:

The application operates on a scalable cloud-native architecture capable of handling thousands of transactions concurrently across areas. This enables the system to be robust and expand with more user adoption. Its backend guarantees low downtime and real-time updates by means of cloud storage and computing optimization. Future modules such as AI-powered pricing recommendations, pest prediction depending on location, and blockchain-based produce tracking can also be included with this. Maintaining the integrity and functionality of the app even in low-resource rural settings, updates are seamless and can be rolled out remotely. Its design gives users trust in the platform by prioritising data security and compliance with data protection criteria.

Empowerment Through Data-Driven Decision-Making:

The digital marketplace thus aims to create a personal and trusted marketplace for your products, as well as one that brings together buyers and producers. The system's dashboards provide farmers with historical data, average price comparisons between products, a study of seasonal demand curves and other relevant analysis tools. Another feature of the marketplace

is the way that shoppers can express their opinions about products and thus their willingness to purchase them (also information that can be useful in improving the market share and profitability of your products). This feedback can also help you improve your quality of produce and offer a consistent level of service.

Economic and Social Impact at the Grassroots:

Free from the usual market restrictions and efficient with trade, the app greatly benefits the livelihoods of small and marginal farmers, allowing for more direct interaction. It lessens dependence on intermediaries, thus providing the rural entrepreneur with a more dignified path. It strengthens collective farming efforts as cooperatives are able to use the platform in organizing their collective sales. Women farmers can also independently use the app to sell their produce, furthering their movements in a country where market access is usually very limited. Its affordability and minimalistic design ensure that even those with limited literacy can use the application. Once the app gains widespread adoption, it can stretch further to become a channel for disseminating agricultural advisories, government scheme information, and emergency alerts.

Catalyst for Rural Innovation and Research:

A certain basketful of data from the given platform is an enabler for some excellent research in agriculture as well as rural economic studies. Researchers of various types can study market supply trends, consumption patterns, logistics efficiencies, and behavioral economic trends within farming communities using anonymized datasets. Such insights can be used by governments and NGOs toward the design of better welfare policies and subsidies. Likewise, incubators and agritech startups can collaborate to develop complementary solutions, such as soil testing services, crop insurance, and micro-lending, via the open APIs provided by the app.

Boosting Food Security and Sustainable Agriculture:

Food distribution is improved and waste reduced when a system ensures direct trade and less post-harvest loss. The transparency, coupled with feedback mechanisms, motivate farmers to diversify into crops and work on quality. Local sourcing cuts down on carbon emissions for transportation, thereby putting the app on track for the greening. The model promotes circular agriculture, where local value chains are given more focus, such as farm-to-table and farm-to-market collaborations.

CHAPTER - 9
RESULTS AND DISCUSSIONS

9.1 Results

The results generated by the mobile application demonstrate its strong contribution towards bridging the gap between farmers and buyers through direct market access. The developed app provides a reliable and user-friendly platform where farmers can list their products, share their locations, and directly connect with potential buyers without middlemen intervention. The following observations and outputs (figure 9.1, 9.2, 9.3, 9.4) were noted during testing:

Figure 9.1

9.1.1 Product Listing and Market Visibility:

The app allows farmers to efficiently upload information about their produce (figure 9.2), including product type, quantity, quality grade, and expected price. The intuitive interface ensures that farmers can complete listings with minimal technical knowledge, thereby enhancing their visibility in a broader market.

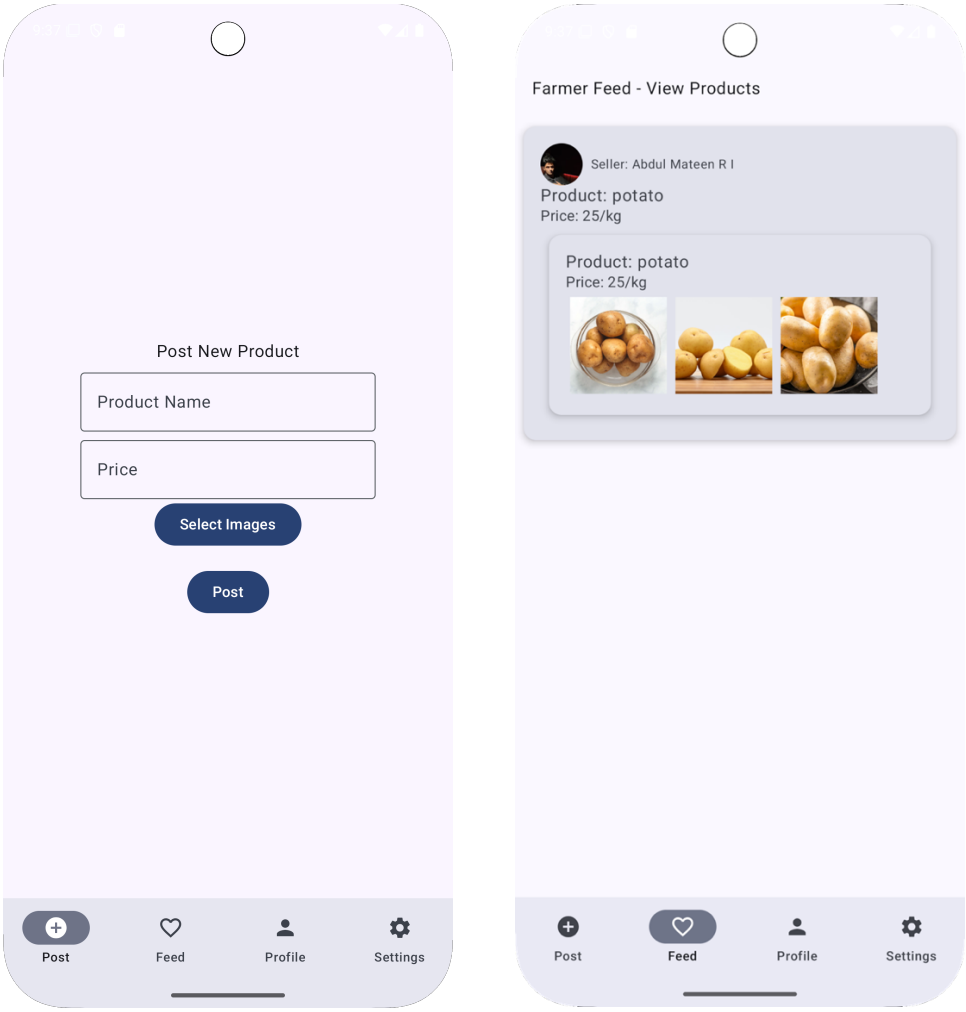

Figure 9.2

9.1.2 Buyer-Farmer Direct Communication:

Buyers have the option to browse through available produce listings (figure 9.2), filtering based on product type, location proximity, and price. The built-in chat feature (figure 9.3) facilitates seamless communication between farmers and buyers, supporting negotiations, queries, and order finalizations within the app itself.

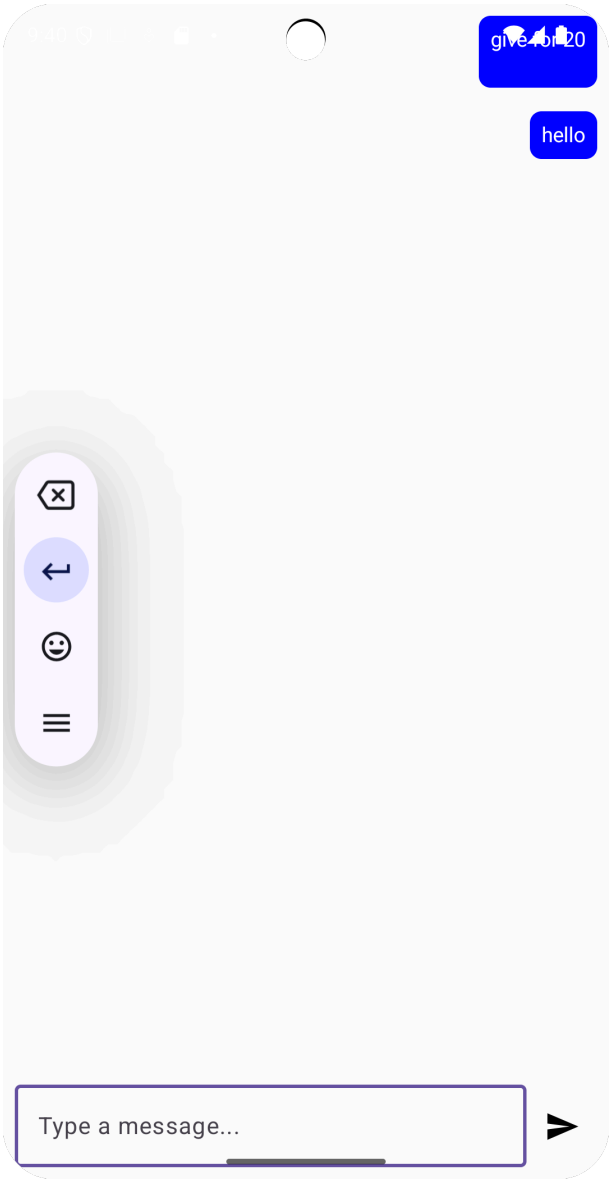

Figure 9.3

9.1.3 Location Sharing Feature:

The app successfully integrated Google's FusedLocationProviderClient to allow farmers to voluntarily share their location (figure 9.4). This feature helps buyers easily identify the proximity of farmers' fields, making logistics planning more efficient and reducing transportation time and costs.

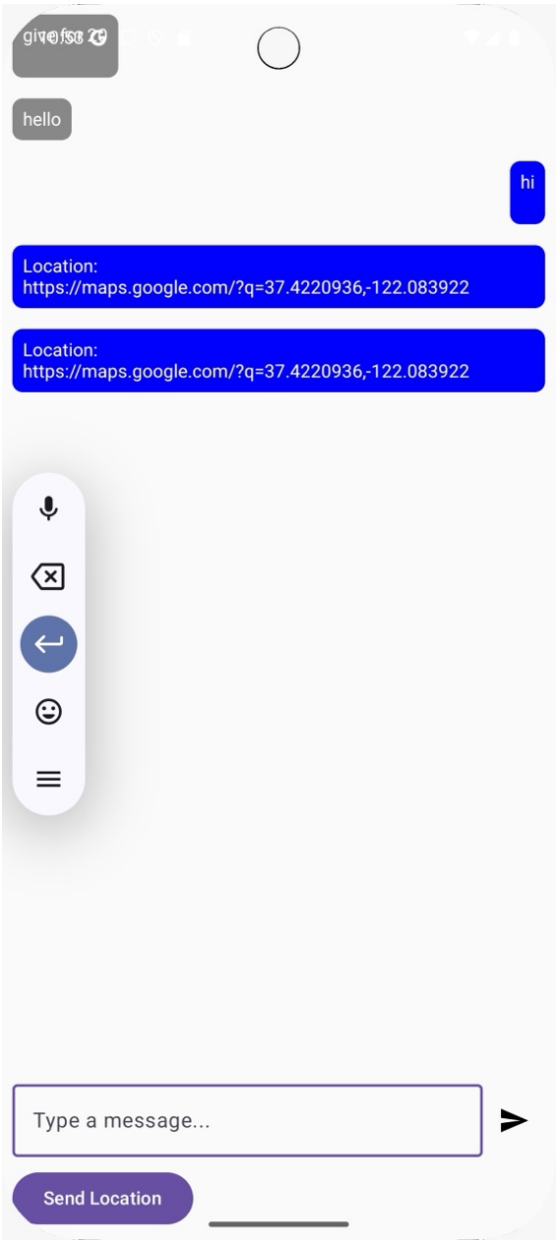

Figure 9.4

9.1.4 Seamless User Experience:

The clean UI/UX design ensures smooth navigation and quick access to key features such as product search, farmer profiles, location maps, and messaging. Extensive usability testing revealed a high satisfaction rate among test users, indicating that the app is simple, intuitive, and effective even for rural users.

9.1.5 Secure Data Management:

User data, including produce details and personal information, is securely managed through Firebase Authentication and Firestore Database. The backend architecture ensures that all transactions and communications remain protected, maintaining user trust.

9.2 Discussions on Results

The results validate the effectiveness of the mobile application in empowering farmers to access larger markets directly. Several discussions emerge based on the findings:

9.2.1 Empowering Farmers:

By enabling farmers to list their products and negotiate directly with buyers, the app reduces dependency on intermediaries who traditionally take a significant share of the profits. Farmers retain more control over their sales and pricing strategies.

9.2.2 Enhancing Transparency:

Location sharing (figure 9.4) adds an element of transparency, allowing buyers to verify the origin of produce and plan deliveries better. However, since location sharing is optional, farmers can choose whether or not to disclose their exact position based on comfort and privacy considerations.

9.2.3 Scalability and Future Integration:

The scalable cloud-based backend, built using Firebase, allows the app to handle an expanding user base without significant degradation in performance. In future phases, additional features such as payment gateways, logistics support, and real-time inventory management can be integrated seamlessly.

9.2.4 Identified Challenges:

During testing, minor challenges such as network instability in remote areas were noted, occasionally affecting real-time updates and location sharing. Improving offline capabilities and optimizing data usage will be essential in future versions to better support rural connectivity limitations.

9.3 Future Directions and Additions

To further enhance the capabilities and impact of the application, several future enhancements are proposed:

9.3.1 Integration of Payment Systems:

Implementing a secure payment gateway in future versions will facilitate complete transactions within the app, allowing farmers to receive payments directly after confirming sales.

9.3.2 Advanced Filtering and Search:

Adding AI-based recommendation engines will help buyers discover products based on past preferences, geographic factors, and seasonal trends, increasing buyer engagement and farmer sales.

9.3.3 Smart Inventory Management:

Allow farmers to manage available stock, receive low-inventory alerts, and update quantities dynamically based on sales trends.

9.3.4 Multilingual Support:

To increase accessibility, the app should expand its language offerings to include regional languages, helping farmers from diverse linguistic backgrounds participate effectively.

9.3.5 Analytics Dashboard:

Provide farmers and buyers with insights on sales performance, price trends, buyer preferences, and operational suggestions to optimize sales and business growth.

9.4 Broader Impacts and Implications

9.4.1 Improving Farmer Livelihoods:

By eliminating middlemen, the app increases farmer profits, contributing to better financial stability, rural development, and agricultural empowerment.

9.4.2 Promoting Local Economies:

Direct transactions between local farmers and buyers stimulate local economies, strengthen community relationships, and ensure fresher produce reaches markets faster.

9.4.3 Digital Inclusion in Agriculture:

The app introduces technology to an industry often lagging in digital transformation. Simple, accessible design ensures even technologically inexperienced farmers can participate, bridging the digital divide.

9.4.4 Sustainability:

By optimizing logistics through location-based services, the app reduces unnecessary transportation, minimizing carbon footprint, and promoting environmentally sustainable practices.

CHAPTER - 10
CONCLUSION

This project demonstrates an end-to-end and scalable solution to farmers' supply direct market access via a mobile application. With the incorporation of several features, such as location sharing in real-time, product listing and safe messaging platform, the app permits smooth trade between the farmers and the buyers, enabling a smooth market. One of the central elements of this system is the integration of the FusedLocationProviderClient enables farmers to post their location to prospective purchasers. This makes it easier visibility and allows more accurate matches, hence it becomes easier for buyers to find their crops or farms of interest. Location sharing is essential, but it is just one of numerous skills intended to empower the farmers, improve the sales process, and simplify the supply chain.

One of the benefits of the system is that it can offer farmers more control over their market presence. By facilitating farmers to list their produce, set prices, and bargain directly to consumers, the platform eliminates middlemen, resulting in more competitive prices to customers and farmers. The user's friendly and uncluttered interface ensures an individual smooth experience for farmers, even those farmers who do not have technical expertise. Also, the multilingual support ensures that the platform is utilized by a variety of users widening its reach and influence in different regions and societies. Privacy and security of the users' data were ensured while developing the app. The application employs secure encryption techniques to safeguard sensitive information such as farm data, product marketing, and direct interaction among farmers and buyers. This guarantees that the platform is a trusted and secure environment for users, which is significant in developing long-term adoption. The inclusion of analytics enables farmers to monitor sales patterns, monitor buyer interactions, and direct their product decisions. With the assistance of data intelligence, farmers are able to optimize their sales approaches and improve the overall marketability of their generate. In addition, the application is scalable, meaning that it can support a growing amount of users as the site expands.

In short, this smartphone application is a groundbreaking achievement in the creation of direct market farmers access, which enhances their economic opportunities and increases sustainable agriculture practices. The combination of location sharing, product listing, direct communication, and robust data security offers a balanced solution that is appropriate for all the players in the agricultural system. The platform can potentially extend to new markets,

providing farmers the resources they require to thrive in a competitive market. Future innovations, like adding payment gateways and other marketing features, will continue to improve capacity of the system, the system is a valuable instrument for farmers worldwide. This project paves the way for a more equitable and effective agriculture market place, facilitating the farmers as well as promoting the growth of the local economy.

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APPENDIX-A
PSUEDOCODE

Pseudocode for Mobile App for Direct Market Access for Farmers

1. Initialize Firebase and FusedLocationProviderClient:
    - Set up Firebase for data storage and user authentication.
    - Initialize FusedLocationProviderClient for real-time location sharing.
2. Define the function get_user_location():
    - Request permission from the user to access their location.
    - Fetch the current location using FusedLocationProviderClient.
    - Return the location coordinates (latitude, longitude).
3. Define the function upload_product_listing(product_details):
    - Accept product details such as crop type, quantity, price, and description.
    - Store the product details in Firebase Firestore under the farmer's account.
    - Return a success or failure message based on the upload status.
4. Define the function search_for_buyers(location):
    - Fetch a list of available buyers based on the location within a certain radius.
    - Filter buyers who are interested in the type of products listed by the farmer.
    - Return a list of buyers' profiles, including their contact details.
5. Define the function send_message_to_buyer(buyer_id, message):
    - Allow the farmer to send a direct message to a selected buyer through the chat system.
    - Store the message in Firebase Firestore under the conversation thread between the farmer and the buyer.
    - Return a success message if the message is successfully sent.
6. Define the function update_product_status(product_id, status):
    - Accept the product ID and the new status (e.g., available, sold, pending).
    - Update the product's status in Firebase Firestore.
    - Notify the buyer if the status change is relevant to them.
7. Main App Flow (User Interaction):
    - Display a welcome screen with options: "List Product," "Search for Buyers," "Messages."

- If the user selects “List Product”:
  - Prompt the user to input product details.
  - Upload the product details to Firebase Firestore using upload_product_listing().
- If the user selects “Search for Buyers”:
  - Fetch the user’s location using get_user_location().
  - Search for nearby buyers using search_for_buyers(location).
- If the user selects “Messages”:
  - Show the farmer’s chat history with buyers and allow sending new messages using send_message_to_buyer().

8. Implement Push Notifications for Location-Related Updates:
   - Send a notification to a buyer when a new product is listed nearby.
   - Notify the farmer when a buyer shows interest or sends a message.
9. Handle User Logout:
   - Provide an option to log out of the app, which clears the session and returns to the login screen.
10. End of Pseudocode

APPENDIX-B
SCREENSHOTS

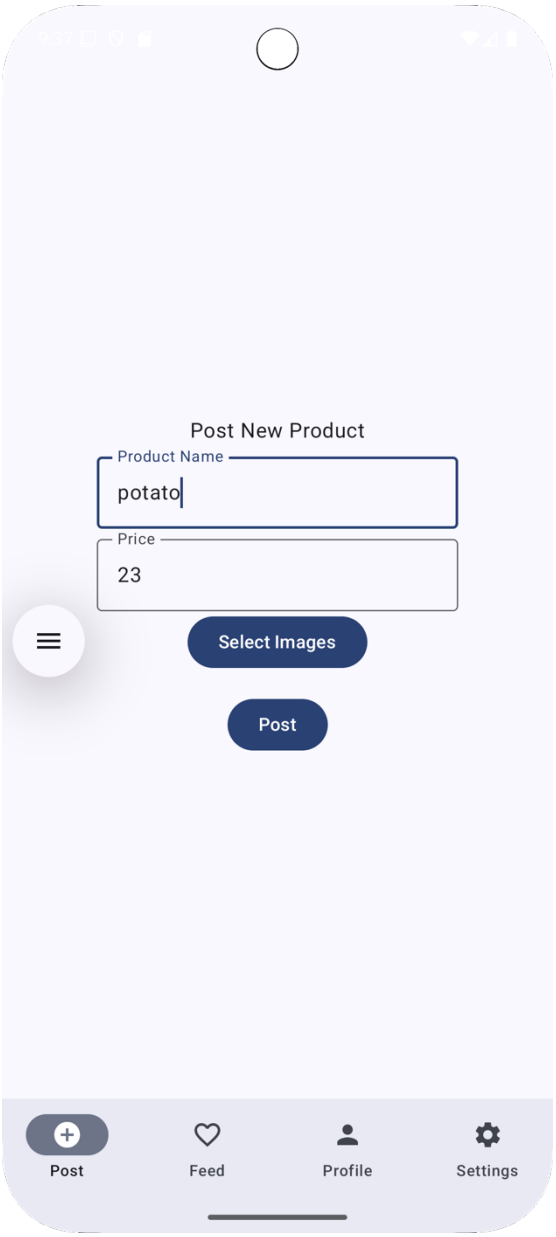
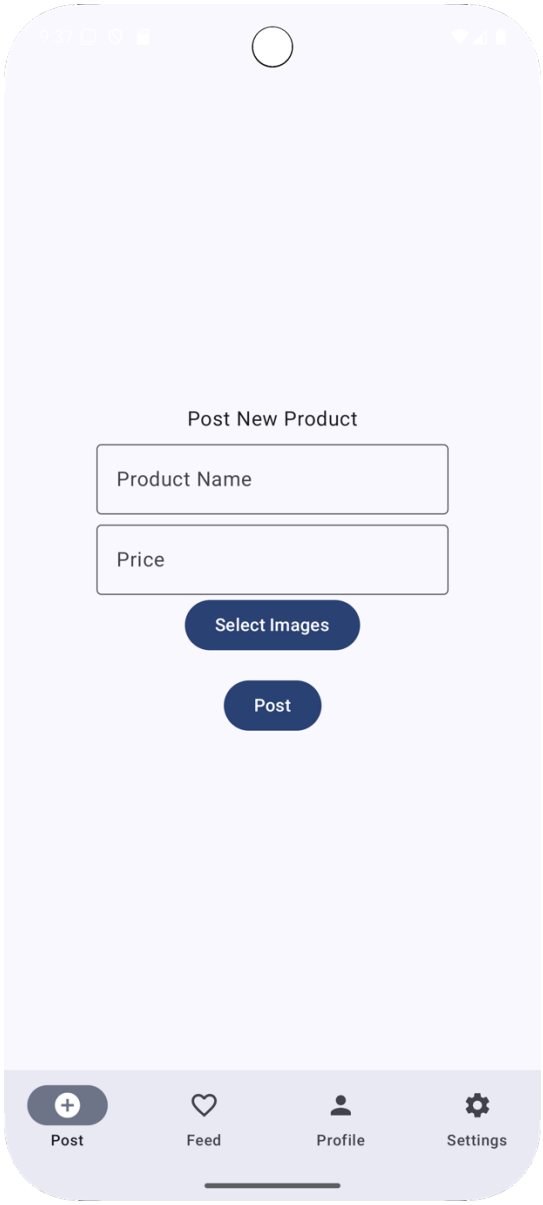


Figure 11.1, 11.2



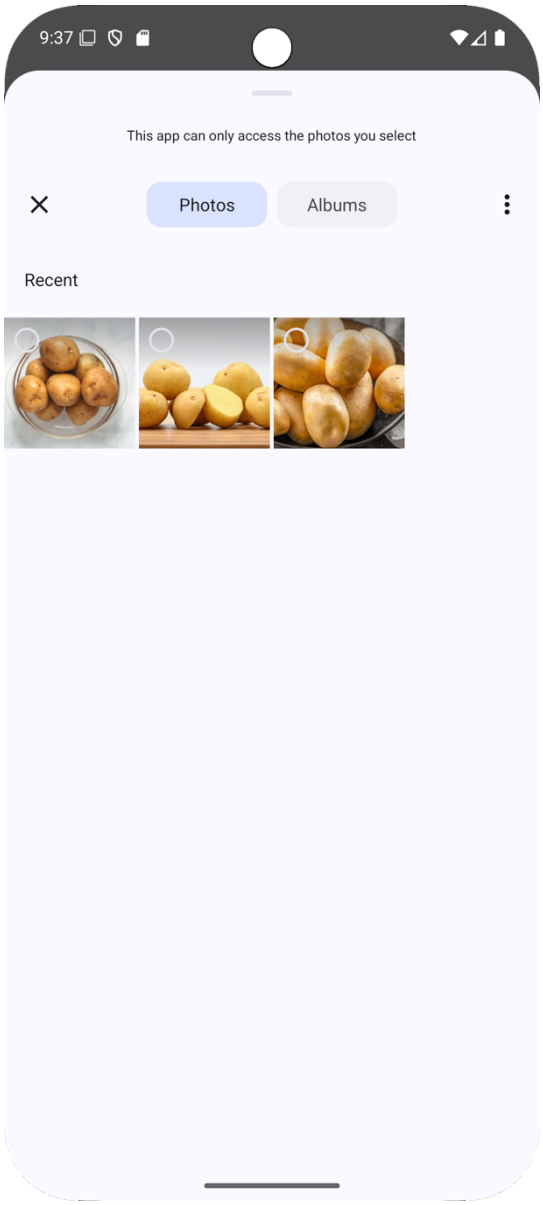


Figure 11.3, 11.4

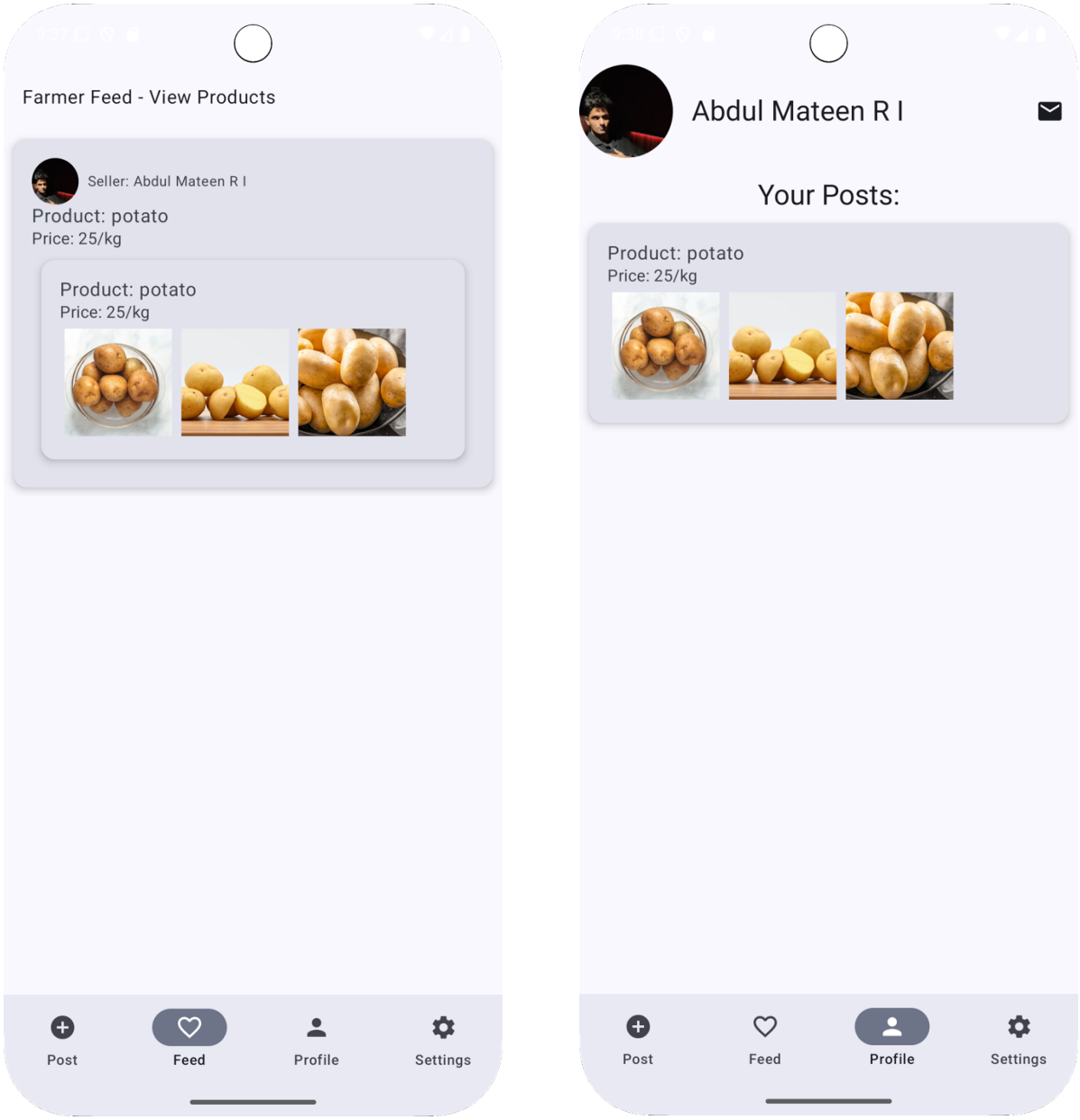


Figure 11.5, 11.6

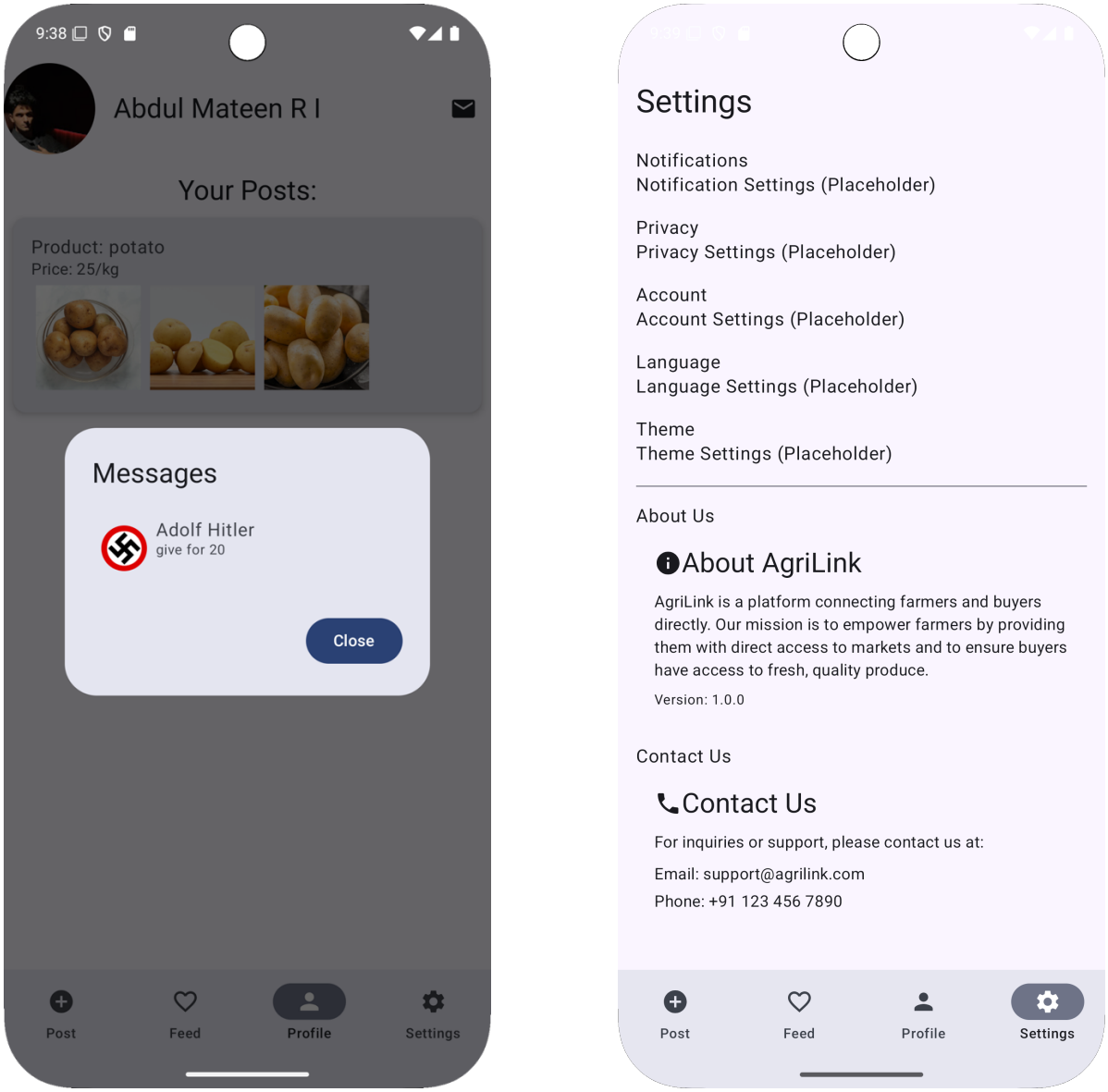


Figure 11.7, 11.8

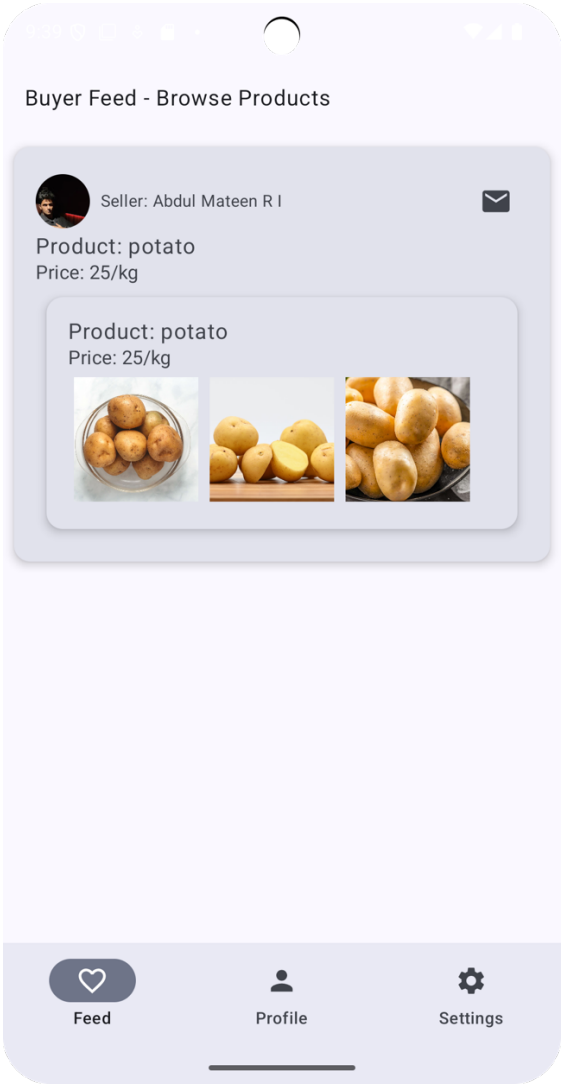


Figure 11.9, 11.10

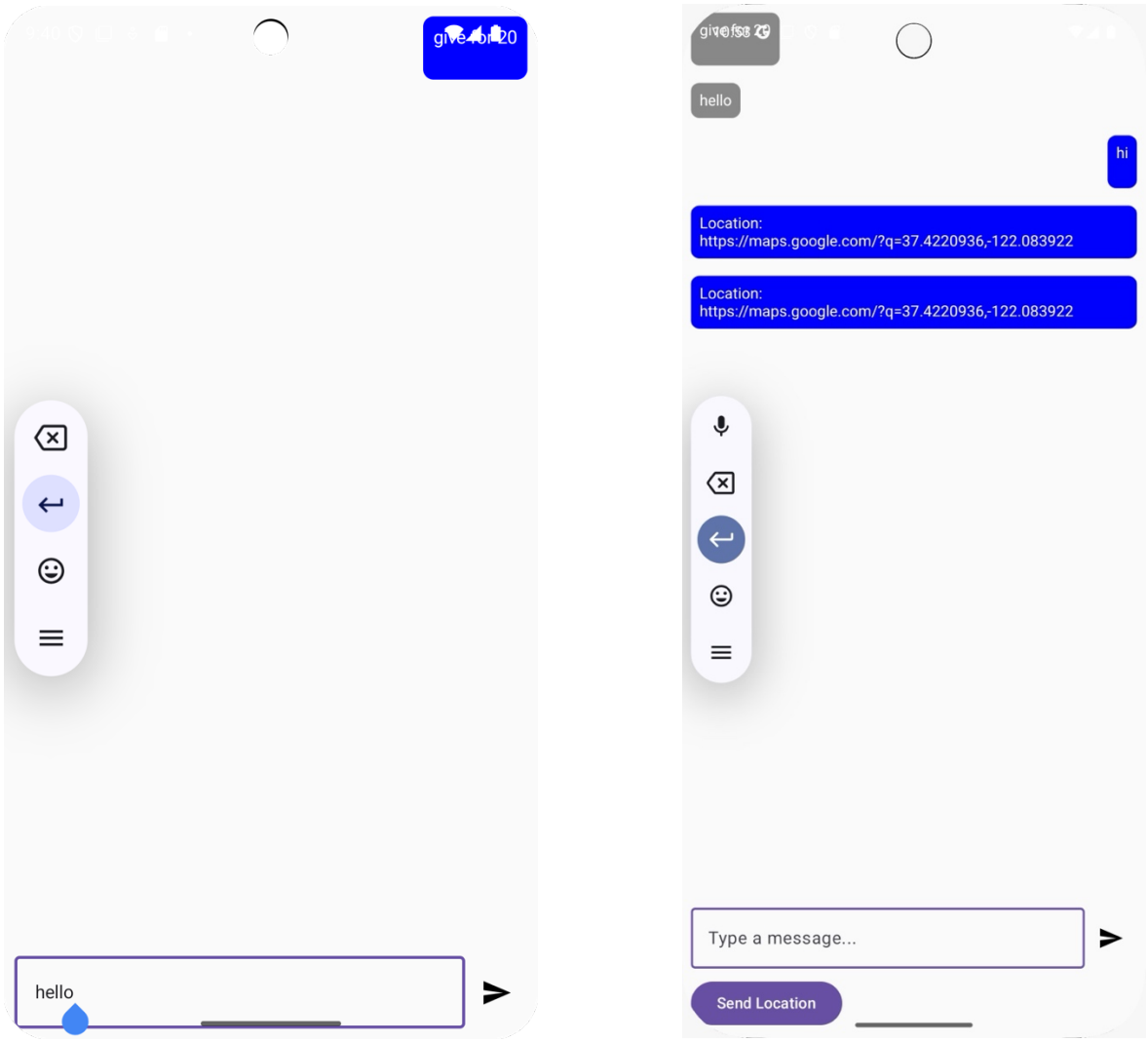


Figure 11.11, 11.12

APPENDIX-C

ENCLOSURES

1. Journal publication

Dear Author Sathvik Srivathsan,

Thank you for submitting your article to 2nd INTERNATIONAL CONFERENCE ON NEW FRONTIERS IN COMMUNICATION, AUTOMATION, MANAGEMENT AND SECURITY 2025 ICCAMS 2025.

Due to the high volume of submissions received, we are currently in the process of plagiarism checking and peer review. We aim to release the acceptance or rejection notifications before the end of this month.

We kindly request your patience and understanding during this process. Rest assured, we are working diligently to complete the review at the earliest.

We sincerely appreciate your cooperation and thank you for choosing ICCAMS 2025 as a platform for your research publication.

Best regards,
Chair,
ICCAMS 2025

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Paper ID	Title	Files
301	**Direct Market Access for Farmers Using a Mobile App**	**Submission files:** Direct Market Access for Farmers Using a Mobile App Research Paper.pdf **Supplementary File Not Uploaded**

2. Similarity Index / Plagiarism Check report

This project aligns with the United Nations Sustainable Development Goals (SDGs) 2, 8, and 9 Zero Hunger, Decent Work and Economic Growth, and Industry, Innovation, and Infrastructure. By providing farmers with direct access to markets through a digital platform, the project helps improve food supply chains and reduce post-harvest losses (SDG 2). It empowers farmers economically by eliminating intermediaries and enabling better price realization (SDG 8). The app also leverages modern technologies like Firebase, Realtime Database, and Android APIs to promote digital infrastructure and foster innovation in agricultural marketing (SDG 9). Together, these contributions support sustainable agricultural development, economic inclusion, and technological progress in rural communities.