

Mobile Application to Direct Marketing Access for Farmers

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Abstract:

The "Direct Market Access for Farmers" project focuses on developing a mobile application to connect the gap between farmers and buyers, promote a direct and transparent marketplace. By eliminating intermediaries, the platform aims to enhance farmers' profit margins, provide real-time access to market demand, and streamline the selling process.

Key features include user-friendly registration, product listing, buyer interaction, and secure transaction systems, ensuring a seamless experience for both farmers and buyers. This solution leverages modern technology to empower farmers, promoting fair trade, economic upliftment, and sustainable agricultural practices.

The application is designed to address the challenges of market accessibility and less efficiencies in the agricultural supply chain, making it a transformative tool for rural and agricultural development.

Keywords—E-commerce, Mobile Application, Web Application, Farmers, Consumers, Agricultural Product, Web Technology, Electronic Payment, Farmers, Agriculture, Crop Yield, Market, Income.

I. INTRODUCTION

The Farmer Market Access mobile application is a groundbreaking initiative designed to empower small and medium-scale farmers by providing them with direct access to consumers and retailers. In many developing regions, farmers face considerable challenges in reaching profitable markets due to intermediaries, who often dictate prices and siphon off much of the earnings. This project aims to address these challenges by facilitating an efficient

platform where farmers can showcase their produce, negotiate prices, and manage transactions directly with buyers.

This mobile application emerges in response to the pressing need for a digital solution that bridges the gap between farmers and consumers, ensuring that farmers can receive fair prices for their goods. Traditional supply chains often leave farmers struggling with reduced income and limited bargaining power, predominantly due to the control exerted by middlemen. This project seeks to

eliminate these intermediaries, creating a transparent marketplace that benefits both farmers and consumers by enhancing income potential and improving the overall efficiency of the agricultural supply chain.

The application will provide essential functionalities such as user registration, product management, secure payment processing, real-time alerts, and AI-enabled crop predictions and resource estimations. By integrating features like a feedback system, chat functionalities for direct communication, and weather forecasting, the app aims to create a user-friendly environment that encourages active participation from both farmers and consumers.

The ultimate goal of the Farmer Market Access application is to foster economic independence for farmers, promote sustainability in agricultural practices, and enhance food traceability. By utilizing advanced technologies, this initiative not only aims to boost the livelihoods of farmers but also to improve the accessibility of fresh produce for consumers, thereby promoting healthier eating choices and supporting local economies.

II. LITERATURE REVIEW

A. Embracing Agricultural Technology

Research shows that technology plays a crucial role in improving farming practices and sustainability. However, for digital tools to be widely adopted, they must be easy to use and culturally relevant, particularly in rural areas with lower digital literacy levels.

B. Challenges Farmers Face in Markets

Farmers, especially those with small-scale operations, often struggle with unfair pricing, middlemen interference, and geographical limitations. These factors make it difficult for them to reach better markets and secure fairtrade opportunities.

C. The Role of E-Commerce in Agriculture

Online platforms are proving to be game-changers by connecting farmers directly with buyers. This reduces unnecessary costs, cuts out intermediaries, and allows farmers to earn more for their produce.

D. The Power of Local Language Interfaces

To make technology truly accessible, it must be available in local languages. Studies highlight that platforms supporting native languages lead to higher user engagement and adoption rates, as they bridge communication gaps and increase ease of use.

E. One-Stop Agricultural Platforms

Having a single platform that caters to various farming needs—buying, selling, and accessing market information—can greatly simplify farmers' experiences and boost efficiency across the agricultural supply chain.

F. User Experience and Simplicity

A well-designed, intuitive digital experience is essential for encouraging farmers to use technology. Research emphasizes the need for simple interfaces that cater to all levels of digital proficiency.

G. Expanding Market Access for Economic Growth

Digital marketplaces empower small-scale farmers by breaking traditional barriers and enabling them to reach a wider customer base. This economic empowerment is vital for their financial growth and stability.

H. Secure and Transparent Agricultural Trading

Agricultural trade can be complex, but technology-driven solutions ensure fair, secure, and efficient transactions. Building trust through transparency is key to a successful digital trading environment.

I. Smart Agriculture and Data-Driven Decision Making

Modern farming benefits immensely from smart technologies like predictive analytics and disease detection models. Data-driven insights help farmers make better decisions, optimize their yield, and ensure sustainability.

J. The Need for Cultural Sensitivity and Inclusivity

For agricultural technology to be successful, it must consider local cultures, traditions, and user preferences. Inclusive design ensures that farmers from diverse backgrounds feel comfortable adopting new digital tools.

III. OBJECTIVES

It is an online service consisting of a Android application. This study is largely focused with establishing customer-producer communication. The whole ordering process is transparent and open. The entire method is clear from start to end. By directly providing customers with the farmers' asking price, we are removing the middleman's privilege.

Our primary product will be an Android application. However, in addition to the app, a responsive app will be accessible for both consumers and service providers. Our services include the following: 1. A app for consumers to buy, 2. A portal for providers, 3. A customer-facing Android app, 4. A service provider-facing Android app, and 5. The platform's dashboard. The progress of the full project is shown in Fig. 1. To provide a comparable experience for consumers across platforms, identical services will be made available on Android and the website. Professionals and consumers will also access an app.

The **workflow of the system** includes **user registration**, login authentication, transaction processing, crop yield predictions, loan application assistance, and a structured product listing mechanism. **Data-driven analytics, predictive insights, and real-time chat functionalities** are incorporated to enhance user experience and facilitate efficient trading. To ensure scalability and security, the system leverages **Firestore for authentication and cloud storage, Flutter Flow for UI development, and Supabase for backend operations**. Additionally, **OpenWeatherMap API integration** provides real-time weather updates to help farmers make informed decisions. The payment system utilizes **PayPal for secure transactions**, ensuring financial transparency.

The overall architecture is designed to be **scalable, secure, and efficient**, providing an end-to-end digital marketplace that benefits farmers and consumers alike..

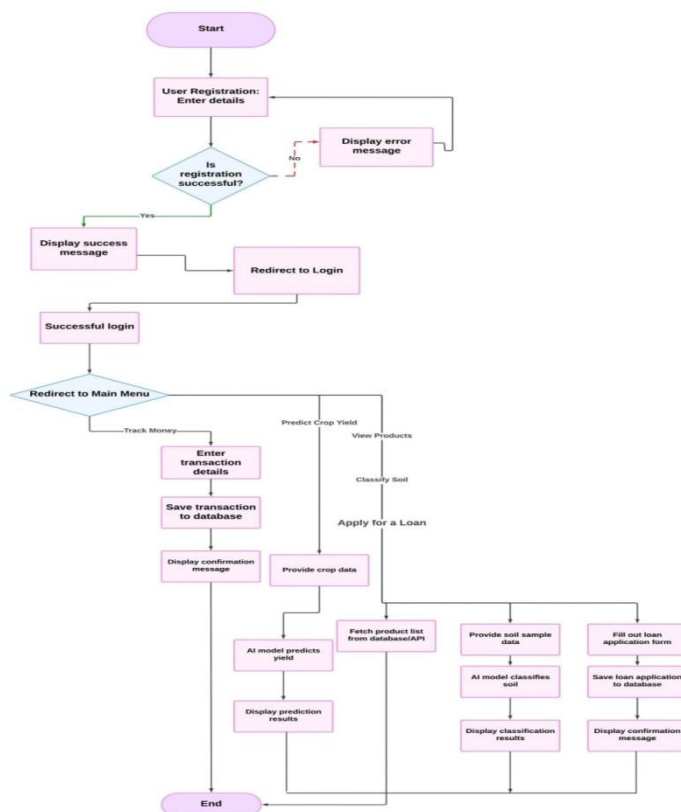


Fig.1 The proposed system's workflow diagram.

A. Features of the System

Platform Dashboard is a platform utilized and monitored by admins. Below mentioned functionality has been included in platform dashboard functionality.

1) **Category Management:** The platform administrator uses this module to manage services categories and subcategories. Several possible categories include the following:

- Service provider dashboard: It is used by the service provider
- Registration and login:
 - ✓ Apply for verification
 - ✓ Login
- Manage services:
 - ✓ Select one or more services from the service category list provided by the platform.
 - ✓ Provide price and estimated delivery time of the service.

- Manage orders:
 - ✓ View the orders
 - ✓ View customer details
 - ✓ View order history

2) **Customer Site:** Customers and visitors use it as the platform's home page. Viewing of services will be available. Users first must log in before the user can place an order.

- ✓ Registration and login
- ✓ Trending and best-seller services recommended services
- ✓ Browse service categories and search for services
- ✓ Add service to cart
- ✓ Provide location, service delivery place, and time
- ✓ Pick one from available professionals and place an order
- ✓ Order history and ongoing orders
- ✓ Apply promo code

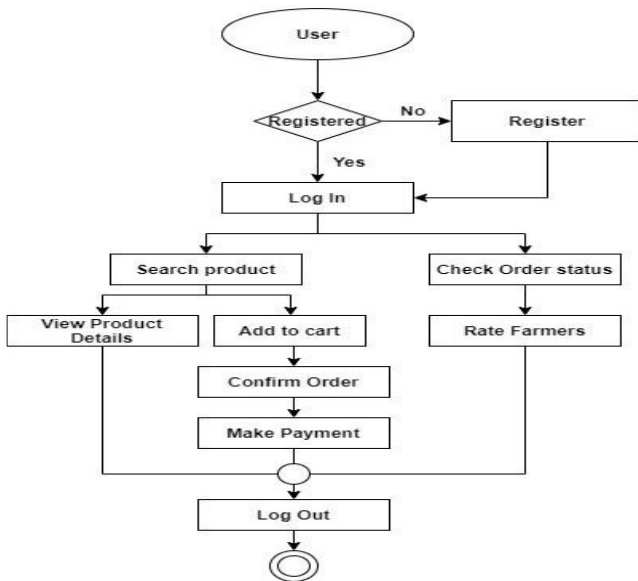


Fig. 2 Flow chart diagram of the customer activity section.

Producer Site: It was developed with the service provider in focus, rather than the end user. It would have the same features as the partner

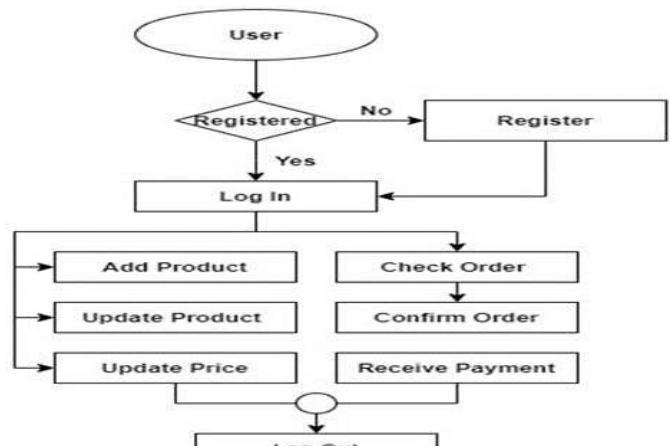


Fig.3 Flow chart diagram of the farmer's activity section.

dashboard site. It also has the following features, which are briefly described below:

- ✓ Login Apply for registration
- ✓ Update profile and business information
- ✓ Get notifications of received orders
- ✓ View previous order history
- ✓ Manage the price of his/her services
- ✓ Opt out from receiving service
- ✓ Rate customer after providing service

Customers may immediately log in using their mobile phone number and OTP. Customers are first given several choices. Numerous services are classified. Before purchasing, consumers should select one or even more products in their shopping basket. But, on the other hand, customers want many services, they must all belong under the same general category. Orders must be placed separately for each category of services unless numerous services are purchased in a single order. After selecting services and their numbers, the customer will enter the place

where services will be provided and the desired arrival day and time. A notification will be sent to the selected producer with the consumer's mobile numbers, address, and a list of desired services. After the producer accepts the order, the customer will be notified and given the

contractor's name and contact information. Orders that the producer does not accept are immediately sent to the platform's next best available employee. As once requested, services are executed satisfactorily for the customer, the applicable charge is payable. It is verified as quickly as the producer pays the cash amount. Customers have the ability to modify their data. The customer can see a record of all previous orders.

Workers must first register on the website by providing their name and telephone number. The worker selects a services sector in which he is an expert and wants to get orders. The platform's administrators will next authenticate his identity and competency. Only confirmed farmers are matched with customers. The employee has the opportunity to update their personal details

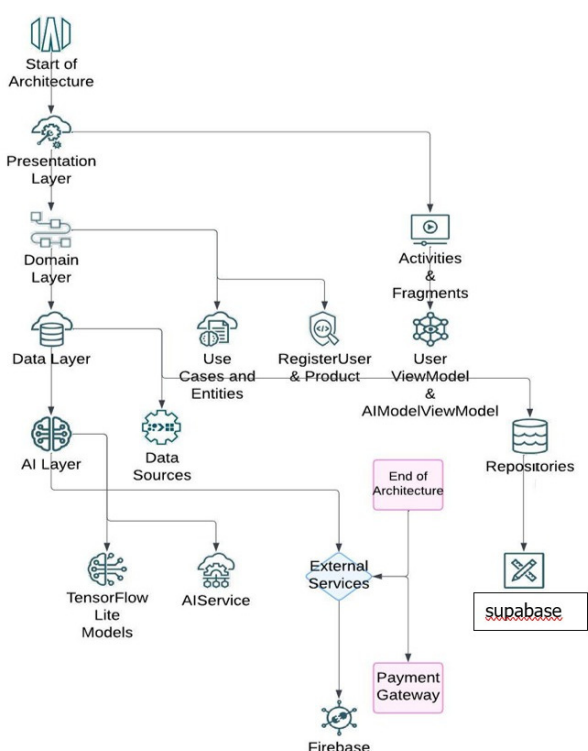


Fig. 4 The data model of the proposed system.

IV. PROBLEM STATEMENT

Farmers often struggle to get fair prices for their produce due to middlemen and lack of direct market access. They have limited insights into crop demand, and pricing, making it difficult to sell at the right time and maximize profits.

Small-scale farmers often face challenges in accessing direct markets, leading to dependency on intermediaries who exploit them with unfair pricing and delayed payments. The lack of a transparent marketplace restricts farmers from reaching a broader audience, limiting their income potential.

Additionally, buyers struggle to connect with reliable local producers, resulting in supply chain inefficiencies and increased costs. Existing agricultural market systems lack real-time communication, secure transactions, and intelligent recommendations to optimize crop selection and pricing.

The absence of digital tools for inventory management and direct negotiations further hinders efficiency. To address these issues, we propose a Direct Market Access Mobile Application for Farmers that enables farmers to list their produce, set competitive prices, and manage inventory in real-time.

V. METHODOLOGY

The Direct Market Access for Farmers platform is designed to eliminate intermediaries, enhance market transparency, and provide AI-powered insights to farmers for better decision-making. The system integrates real-time product listings, soil classification, crop recommendations, weather forecasting, and secure transactions to create an efficient, technology-driven agricultural marketplace. The mobile application serves as the primary interface for farmers and buyers, ensuring seamless interactions, inventory management, and direct communication.

The core components of the system include: Farmer Registration and Profile Management – Farmers can create and manage profiles, update their details, and showcase their products.

Product Listing and Marketplace – Farmers can list their produce, set prices, update inventory, and buyers can browse and purchase directly.

Soil Classification and Crop Recommendation – AI-based analysis of soil properties helps farmers choose the best crops for higher yield.

Weather Forecasting – Real-time weather updates assist in scheduling irrigation, planting, and harvesting.

Secure Transactions and Order Management – Integrated payment gateways and a transaction history module ensure smooth financial transactions.

Real-Time Chat and Notifications – Buyers and farmers can communicate directly, negotiate deals, and receive timely updates.

This methodology ensures a scalable, secure, and user-friendly experience that enables farmers to maximize profits, improve productivity, and make data-driven agricultural decisions.

VI. RESULT & ANALYSIS

Our aim with this study was to demonstrate the proposed mobile applications and website while also explaining the categories, subcategories, and how they will be maintained in the future. Here is a graphical tour of the project from start to completion, including Web-based and Android-based features.

A. Android Based Features (For Consumers):

I) Frontend Development

A. Home Page: The administrator panel has features that benefit the marketplace's moderators. Admins may perform CRUD operations on various entities, including categories, services, and workers. Consumers may use this site to search for products and buy a wide variety of services. We want to simplify the customer experience by designing a simple user interface.

Dynamic Product Listings – Farmers' produce is displayed in **real-time**, with options to **sort by crop type, price, and location**.

· **AI-Powered Recommendations** – The dashboard shows **customized crop recommendations** based on soil health and weather conditions.

· **Quick Navigation** – A **simple, icon-based UI** ensures **ease of use** for farmers with **low digital literacy**.

· **Live Weather Updates** – Integrated **Open Weather Map API** displays **real-time and forecasted weather data** for better farm planning.

· **Market Price Insights** – Shows **current crop prices** to help farmers set **competitive pricing**.

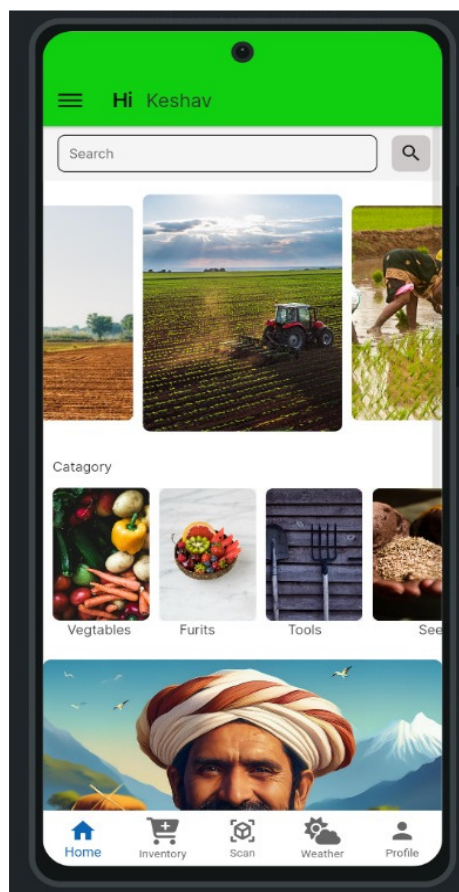


Fig. 5 Home Page Screenshot of the customer site. It is mainly contained in the category link.

B. Sign-In Sign-up Page: The **Sign-In and Sign-Up module** is a crucial component of the application, ensuring secure authentication and access control for farmers, buyers, and administrators. The registration process requires users to input essential details such as name, email, phone number, and password, with role selection and OTP verification for added security. User credentials are securely stored in

Firebase Authentication and Supabase, while validation checks prevent errors like duplicate entries and weak passwords. The login mechanism uses email-password authentication and OAuth for third-party sign-ins, with role-based access directing users to their respective dashboards. Security measures include password hashing, session management, and optional multi-factor authentication (MFA) to protect user data.

Additionally, the module is designed with a user-friendly interface, multi-language support, and clear error prompts to ensure accessibility and ease of use, especially for farmers with limited technical experience. This implementation guarantees a seamless, secure, and scalable authentication process, forming the foundation of user interaction within the platform.

details such as product name, category, quantity, price per unit, and location, with an option to upload images for better visibility. Data validation checks ensure accurate entries, preventing errors like negative pricing or incomplete information. The product details are securely stored in the database using Firebase Firestore and Supabase, ensuring real-time updates and easy retrieval.

The module supports inventory management, allowing farmers to update stock levels or modify listings as needed. Additionally, a user-friendly interface with dropdown selections, image compression for faster uploads, and multilingual support enhances accessibility for diverse user groups. With a structured and intuitive design, this feature streamlines product listing, improves market reach for farmers, and ensures buyers access fresh, locally sourced produce efficiently.

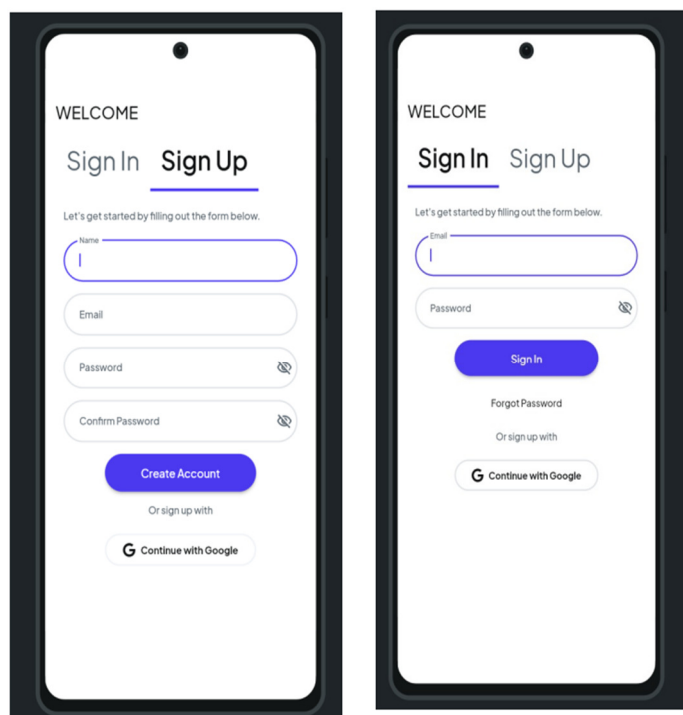


Fig.6 Sign-In and Sign-up page

C. **Add products:** The **Add Products module** allows farmers to list their produce efficiently, ensuring seamless transactions between sellers and buyers. The interface enables users to input key

D. **Profile page:** The **Profile Page module** serves as the central hub for farmers and buyers to manage their personal information and account settings. Users can update essential details such as name, contact information, location, and profile picture, ensuring credibility and trust in transactions. The module integrates Firebase Authentication for secure user verification and allows password management, including reset and update functionalities. Profile data is stored in Fire store and Supabase, ensuring real-time synchronization across devices.

Additionally, farmers can showcase their farm details, past transactions, and product listings, enhancing transparency for potential buyers. The user interface is designed for easy navigation, with multilingual support and optimized performance for low-bandwidth areas. This feature improves user engagement, fosters trust between farmers and buyers, and ensures a seamless and secure experience within the platform.

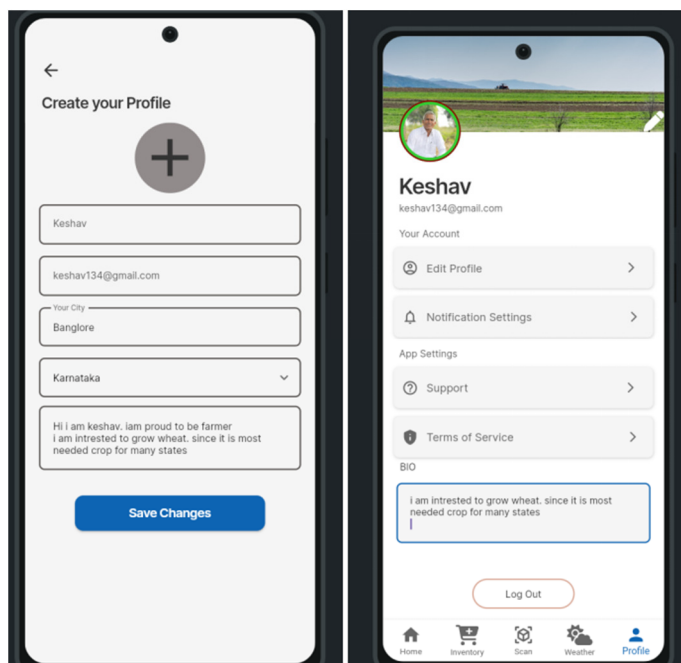


Fig.7 Profile page.



Fig.8 Scan page

E. Scan Page: The **Scan Page module** is designed to enhance user convenience by enabling seamless scanning of product barcodes, QR codes, or images for quick data retrieval. This feature is particularly useful for farmers to identify soil quality, crop health, or product details by leveraging AI-based image processing. The module integrates OpenCV and Firebase ML Kit to process scanned images and extract relevant information, such as crop recommendations or product details. Users can scan and upload images in real time, with data being stored in Fire store or Supabase for further analysis.

Additionally, the UI is designed for simplicity, ensuring accessibility even for users with minimal technical knowledge. This feature streamlines product verification, reduces manual data entry.

F. Weather Forecasting:

The **Weather Forecasting module** is an essential feature that provides farmers with real-time and

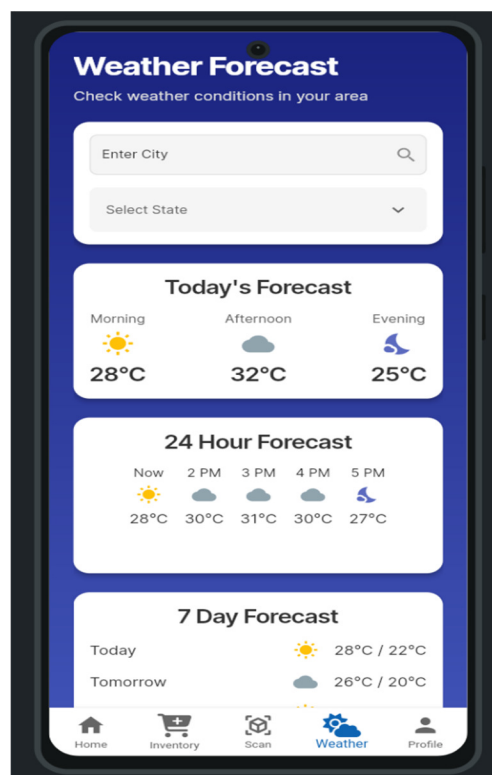


Fig.9 Weather Forecast page

predictive weather data to assist in agricultural planning. This module integrates the **Open Weather Map API** to fetch current weather conditions, temperature, humidity, The **weather alerts and notifications** system warns farmers about extreme weather conditions such as heavy rainfall, storms, or droughts, allowing them to take necessary precautions. **Graphical representation** of weather trends simplifies complex data, making it easier to interpret. Additionally, **offline access** ensures that recently fetched weather data remains available even in low-connectivity areas. This module is also linked with the **Crop Recommendation System**, By offering **timely and data-driven insights**, the weather forecasting module significantly reduces risks associated with climate unpredictability and helps farmers optimize their farming practices.

G. **Product View:** The **Product View Page** in the **Direct Market Access for Farmers** platform is designed to provide detailed insights into agricultural produce, including **pricing, availability, and essential product details**. The user-friendly interface ensures farmers and buyers can access critical information efficiently.

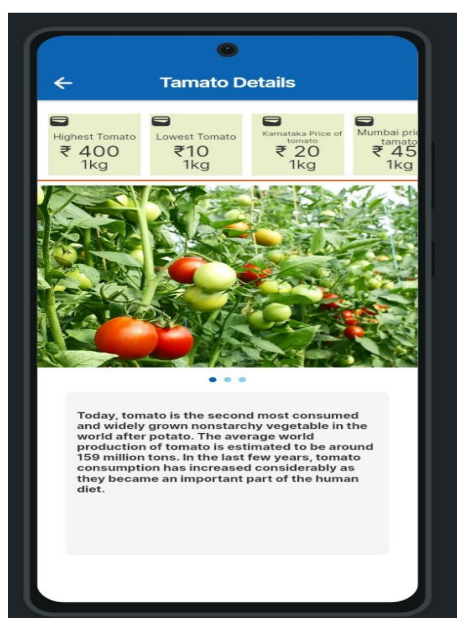


Fig.10 Product View Page

H. **Payment Details:** The **Payment Processing Module** ensures secure and seamless financial transactions between farmers and buyers. It leverages **PayPal's API** for fast, reliable, and globally accepted payments while maintaining compliance with security standards.

A key feature of our payment module is the **escrow mechanism**, where payments are securely held until transaction conditions are met. This increases trust between buyers and sellers, ensuring that funds are only released upon successful completion of a purchase. In case of disputes or order cancellations, the system supports **refund processing** through PayPal's API, providing users with a fair and reliable resolution process.

From a user experience perspective, we have designed an intuitive UI for the payment page, allowing users to select payment methods, view an order summary, and receive transaction confirmations in real time. The backend, deployed via **Firebase Functions and Supabase**, ensures scalability and real-time updates for transaction status. Continuous performance monitoring helps in identifying potential issues, ensuring smooth payment processing.

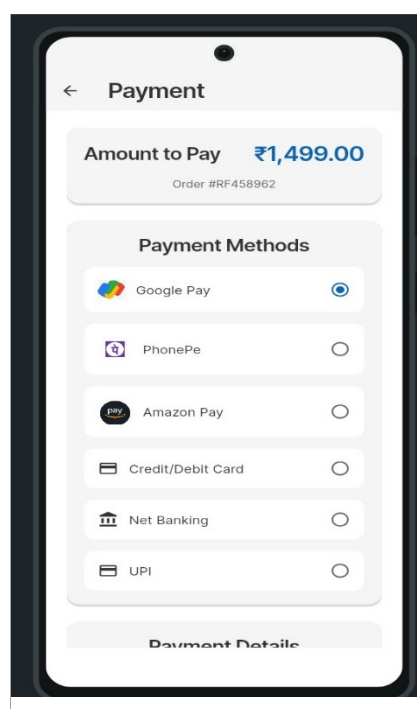


Fig.11 Payment Page

II) Backend Development (Flutter, Firebase & Supabase)

A) Set Up Backend Services

- **Action:** Configure Firebase & Supabase to manage authentication, database storage, and backend logic.
- **Explanation:** Firebase provides real-time database services, while Supabase offers PostgreSQL-based backend solutions with scalable performance and security.

B) User Authentication and Profile Management

- **Action:** Implement Firebase Authentication for sign-up, login, and profile management.
- **Explanation:** Firebase Auth supports email/password, phone OTP, and third-party authentication methods for secure user access.

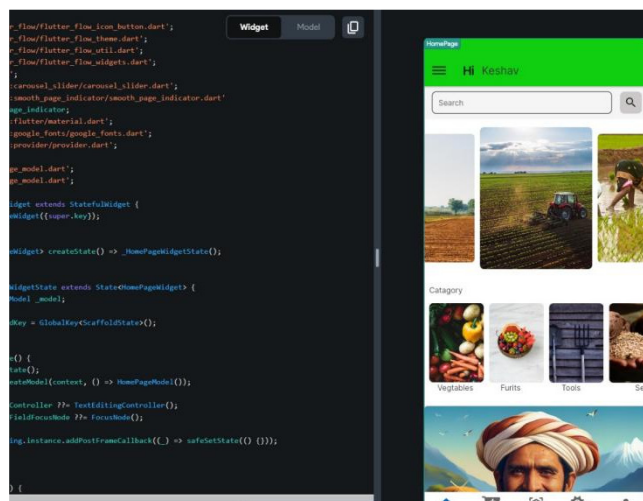


Fig.12 Handling Home page

C) Database Integration (Firestore & Supabase PostgreSQL)

- **Action:** Structure the database to store user profiles, product listings, transactions, and market data.
- **Explanation:** Firestore ensures real-time updates for seamless data flow, while Supabase PostgreSQL provides relational database capabilities for structured data storage.

D) Product Management API

- **Action:** Create APIs to fetch, update, and manage product listings, prices, and details.
- **Explanation:** These APIs allow farmers to update product information dynamically, ensuring transparency and efficiency in the marketplace.

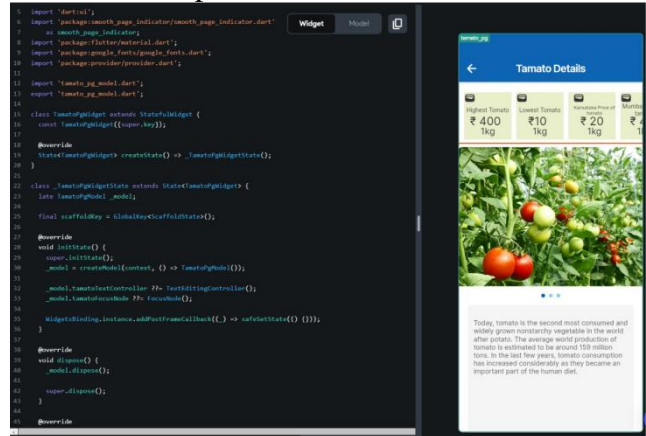


Fig.13 Product Details page

E) Payment Processing (PayPal Integration)

- **Action:** Integrate PayPal APIs for secure and seamless transactions between farmers and buyers.
- **Explanation:** PayPal ensures reliable payment processing with encryption, fraud detection, and multi-currency support.

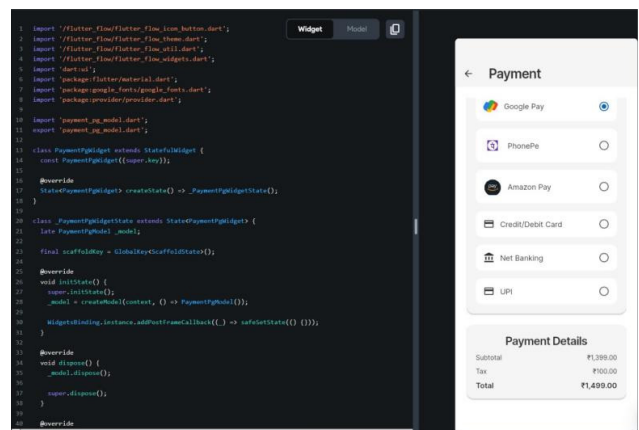


Fig.14 Handling Payment details

F) Weather API Integration (OpenWeatherMap API)

- **Action:** Fetch and display real-time weather data to assist farmers in making informed decisions.

- **Explanation:** Weather data, including temperature, humidity, and rainfall, helps optimize farming practices based on climatic conditions.

G) Security & Performance Optimization

- **Action:** Implement Firebase security rules, role-based access control, and API rate limiting.
- **Explanation:** These security measures protect sensitive user data, prevent unauthorized access, and enhance overall system performance.

H) Deployment and Monitoring

- **Action:** Deploy the backend services using Firebase Hosting and Supabase infrastructure.
- **Explanation:** Firebase Hosting ensures low-latency data delivery, while Supabase offers efficient database management with automatic scaling.

VII. DISCUSSION AND LIMITATIONS

E-Farmers thinks it can give clients a better way to locate local services while also empowering service providers by finishing the Android app and website architecture. Our service marketplace links clients with authorized service providers through a location-aware app and web platform, enabling them to acquire estimates from a vast number of support companies in a matter of seconds.

A. Security Issues

Android's open-source nature is both an advantage and a disadvantage for developers. Android users are often the target

of malware and assaults, but Google reacts quickly by issuing security upgrades. Regrettably, the majority of people do not frequently update their devices. Thus, app developers are often forced to manage user information in a self-serving way, whether by encrypting it entirely, adding additional security measures, or completely ignoring user input.

B. Future Enhancement

A. AI-Driven Price Prediction

Incorporating machine learning algorithms will enable the platform to analyze historical pricing trends, weather conditions, and market demand to provide farmers with real-time price forecasts. This will empower farmers to make informed selling decisions, reducing the risk of price fluctuations and maximizing their profits.

B. Blockchain for Secure Transactions

The integration of blockchain technology will ensure **transparent, tamper-proof transactions** by implementing **smart contracts** for automated payments and escrow services. Using blockchain networks like **Ethereum or Polygon**, buyers and sellers can conduct transactions securely without the need for intermediaries, increasing trust and reducing fraud risks.

C. Multilingual and Voice-Assisted Navigation

To enhance accessibility, the platform can introduce **regional language support and voice-assisted navigation**. Since many farmers are not proficient in English, enabling them to use the platform in their preferred language through text and voice commands will significantly increase adoption and ease of use.

VIII. CONCLUSION

Over the last five years, the rapid growth of internet use has helped surrender modern technologies and increased access to cloud services. Agricultural E-Commerce seems to have the ability to considerably improve financial circumstances for farmers by removing intermediary costs and creating a direct relationship between producers and buyers. Existing internet commerce infrastructures are incapable of accomplishing the aims of agricultural e-commerce. As a result of our analysis of earlier work, we planned and constructed both Android and Web applications. This study presented e-Farmers' Hut as a channel between farmers and customers. The authors develop the both web and mobile apps. The application completed the testing process without

encountering any errors. The application's features are designed to be user-friendly for both clients and farmers. The application will be created in the Bengali language in the future to make it more accessible to users. Moreover, the application would be made lower in size and more user-friendly, since internet connectivity is not always reliable in rural areas where farmers live.

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