E-Farma: A Flutter-Based Middleware Application for Agricultural Land Rental

Abhishek Shamkumar Yewale[1], Prof. Bisweswar Thakur[2]

[1] Master of Computer Application & Trinity Academy of Engineering, Pune
[2] Master of Computer Application & Trinity Academy of Engineering, Pune

ABSTRACT –

This paper presents E-Farma, a Flutter-based mobile application designed as a middleware platform to connect buyers and sellers involved in renting agricultural land. The application addresses the challenges faced by both parties in finding reliable, secure, and transparent land rental agreements. By leveraging modern cross-platform development with Flutter, E-Farma provides a seamless user experience, efficient data management, and real-time communication between users. The app supports location-based search, secure transactions, and user verification to promote trust. Initial testing demonstrates the app's potential to simplify agricultural land rentals and boost efficiency in rural economies.

*Key Words***:** Agricultural Land Rental, Flutter, Middleware, Mobile Application, E-Farma, Location-Based Services.

1.INTRODUCTION

Agricultural land rental is a critical activity for optimizing land usage and increasing farm productivity. However, the traditional process of finding rental land or tenants is often inefficient, lacks transparency, and suffers from trust issues. Existing solutions are fragmented or region-specific and rarely leverage modern mobile technologies.

E-Farma is developed as a cross-platform mobile application using Flutter, targeting farmers, landowners, and renters. It acts as a middleware platform that bridges buyers and sellers of agricultural rental land, providing an intuitive interface for search and negotiation. The app aims to enhance accessibility, transparency, and convenience for stakeholders in rural agricultural economies.

2. Methodology

2.1 Technology Stack

The app is built using **Flutter**, enabling rapid development and deployment on both Android and iOS devices. Firebase services are utilized for backend functionalities, including authentication, real-time database, and cloud storage. Google Maps API integrates geolocation features for land searching.

2.2 Data Collection and Management

Users create profiles that include personal details and agricultural preferences. Landowners upload property details, including geolocation coordinates, images, and rental terms. Buyers can filter listings by location, price, land size, and crop type suitability.

2.3 Application Features

User Authentication: Secure login and registration using Firebase Authentication.

Land Listings: Sellers post available lands with detailed descriptions and images.

Search & Filter: Buyers search land using geolocation and apply multiple filters for precision.

Direct Communication: Feature for direct negotiation between buyers and sellers.

2.4 Middleware Logic

The app's middleware processes user requests, manages real-time updates, and ensures synchronization between buyers' search queries and sellers' land postings. Security protocols protect user data and transaction integrity.

3.Results and Discussion

E-Farma was tested with a pilot group of 50 users comprising landowners and tenants in a semi-urban area. The app showed the following:

- Users found it easy to list and search for rental land using location-based filters.
- The chat feature improved communication efficiency, reducing the need for offline meetings.
- Ratings and reviews helped build trust in user credibility.
- Real-time notifications ensured timely updates on rental requests and agreements.

Challenges included network connectivity issues in rural areas and the need for greater user onboarding support. Future versions aim to include offline capabilities and integration with government land records.
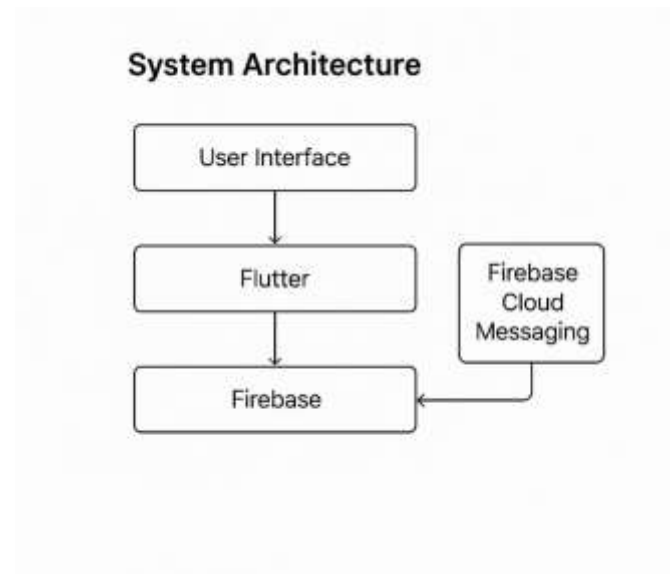

Fig -1: System Architecture Diagram

The E-Farma application follows a streamlined client-cloud architecture integrating Flutter for the frontend and Firebase services for the backend. The architecture comprises:

- **Flutter UI**: The user interface is built with Flutter, providing a cross-platform and responsive experience for users to register, list land, search, and chat.
- **Firebase**: Acts as the backend-as-a-service (BaaS), managing authentication, real-time database, and cloud storage to handle land listings, user data, and messages.
- **Firebase Cloud Messaging (FCM)**: Enables real-time push notifications for chat updates, booking confirmations, and alerts between landowners and renters.

This architecture ensures real-time interaction, scalability, and low-latency performance, essential for a smooth agricultural land rental experience.

Fig -2: Dashboard Screenshot

The Dashboard in the E-Farma mobile application serves as the central hub for users after logging in. It provides an intuitive overview of the platform's key features and functions based on the user's role (landowner or land seeker).

Fig -3: Description Page Screenshot

The Description Page in the E-Farma mobile application provides users with detailed information about a selected agricultural land listing. It is designed to offer a transparent, user-friendly, and interactive experience that helps potential renters make informed decisions.

3. CONCLUSIONS

E-Farma provides a promising solution to the challenges in agricultural land rental by leveraging Flutter's cross-platform capabilities and modern cloud services. It simplifies the rental process, enhances transparency, and fosters a trusted community of agricultural stakeholders. Further development and wider user adoption can significantly impact rural land utilization and farm productivity.

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