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Fresh Roots - Mobile Application

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Abstract: The suggested work is a mobile app assists farmers to sell crops via fresh roots, resulting in success and raising their standards of living. This work offers a solution for farmers futile during the pandemic since they are unable to sell the crop yields due to insufficient buyers and market agents who did not purchase the crop yields even at a quarter of the market price. Most farmers end up receiving low remuneration for their labor as a result of the mediators. Real-time application is to enhance communication between buyers and farmers easily with an effective solution to transform agricultural products for higher returns on their harvests. Given the conditions presented for this issue, an Android mobile application-based solution is implemented that is a means for the farmers to market their crop production assists them to be more assured of their sales, and will make agriculture worthwhile by beating the mediator-led farm value chain. The mediators are substituted by a virtual mechanism that ensures direct contact between the farmers and the markets or purchasers with multiple alternatives. A request is nothing but from farmer side to know about mobile and how to operate and get more insights. The application is developed using flutter. This application solves the communication of the farmer and the buyer and they can market their crop as they could not get any buyer and market place the fresh roots facilitates the selling of their crops in the app and they can communicate directly and assist farmers to cultivate.

Keywords: Android App, Mobile Application, Direct Marketing, Flutter App.

I. INTRODUCTION

Fresh roots are an android application where 10,000 farmers are joining together to sell their crops through mobile application. The use of mobile technology in agriculture is increasing daily and, with these marketing apps farmers can get access to best farming practices, market prices, and more. The proposed app is available in Google play store and apple store and can be easily available and can be easily downloadable using a Smartphone with internet. By using fresh roots app farmers can improve their farming practice and have options to post their crops and how much quantity and the price and they can upload the description of the crop and what type of the crop and the request is to know the knowledge about mobile devices how to use and how make use of insights in the android application that helps farmers to gain the knowledge in this fast moving generation. Fresh roots invite 10,000 plus farmers to sell their crops through worldwide and profits will be maximized as customers interact directly with farmers and negotiate based on user preferences. It helps farmers to improve and gain more confidence in their sales and will make farming more valuable. Here no more mediators are joined only farmer and the buyer and 100% fair goes to the farmers.

Fresh roots comes with English and kannada for the regional language that states the represents the state language and helps farmers to understand even more because many farmers are not that educated so there understanding purposes came through this idea. Fresh roots help farmers to start their business and not only for farmers but also for the buyers who are buying the crops from fresh roots they will get an organic and fresh product from farmers. Fresh roots has the name states fresh roots a meaning the products that comes from the farmers native not with the mediators and door steps to the buyers. The fresh roots piloted mobile application helps farmers to sell fresh fruits and crops and spices and roots across the country so that farmer can improve income and improves their confidence and can able talk to the buyers and the people are buying through the fresh roots here there is no price concession . Both farmers and buyers need to create an account and log in to the application. The farmers have to upload the details of the crop that includes the crop type and name of the crop and the quantity and the photo of the crop and the price of the crop. The app contains roll based login so that when a seller logs in they can't see the buyers and when a buyer logs in they are unable to see the farmers account this follows same for both but farmer can see the details of who are going buy their crop and when a farmer uploads a crop the buyer gets notified about the crop details and when you subscribed to the farmer only you get notification from the crop if you unsubscribe the farmer then you won't get any notification from the farmer.

Fresh roots won't allow the normal users to allow into the app unless u creates an account. It includes only seller and buyer account no other user account permitted. Farmer Selling System is an end-to-end digital system that unites major stakeholders within the agro-supply chain farmers, companies, and administrators—via its center application, which is the Farmer Selling App. The central idea of the system is to facilitate seamless and effortless crop sales, minimize human interference, and instill transparency within agri-business. Farmers can simply list the crops they wish to sell, verify orders, and handle payments directly via the app, minimizing the reliance on middlemen and allowing them to receive reasonable prices. Firms are benefited by browsing crop availability, placing purchase agreements, and processing orders within a streamlined, automated setting, providing timely procurement and transparent communication with farmers. The admin role is crucial for monitoring the overall functionality of the system. Administrators are able to create detailed reports for performance monitoring and maintain the integrity of the platform by controlling user accounts and tracking all transaction activities. This monitoring ensures that farmers and companies are both operating within a secure and trustworthy environment. By digitizing and centralizing these processes, the Farmer Selling System boosts productivity, facilitates decision-making with real-time access to data, and provides improved collaboration for all the parties involved in the agricultural trading network.

II. LITERATURE SURVEY

The authors [1] Mobile Application for Agriculture" discusses several existing mobile applications for enhancing agricultural practices, each of which addresses different farming support aspects. CCMobile App focuses on environmental monitoring with temperature and humidity data but does not include crop disease detection features. Spray Guide helps in the calculation of spraying parameters for crops and enables experience sharing but does not facilitate disease identification. IFFCO Kisan provides expert guidance on agriculture cycles and water management but does not provide regional language support, restricting accessibility Mandi Trades supports direct farm product marketing with location intelligence but not with product quality checks. The authors of [2] an overview of current agricultural mobile applications and their shortcomings. Such applications as CCMobile, Spray Guide, IFFCO Kisan, Mandi Trades, and AgriSync are mentioned, each providing stand-alone functionalities like monitoring the environment, calculating pesticides, expert consultation, marketing crops, or communication between farmers and advisors. The authors of [3] the increasing involvement of mobile apps in offering market access and decision support to farmers. It suggests the key issues in small-scale farming, including lack of market price information accessibility, crop overproduction, and low marketing infrastructure. Research indicates that ICT and mobile technologies facilitate wastage reduction as well as enhancement of agriculture transparency. But a majority of apps currently do not feature demand forecast or location-specific supply-demand mapping. Also, the use of such technologies is hampered by low awareness, poor digital education, and low promotion. The authors of [4] the changing role of precision agriculture and artificial intelligence (AI) in increasing crop yield, resource optimization, and farm decision-making. Precision agriculture has come a long way with the advent of sophisticated technologies like wireless sensor networks (WSNs), IoT, big data, machine learning, edge/fog computing, and software-defined networks. These technologies have facilitated the automation and optimization of agricultural processes, which have become more sustainable and efficient. Previous research has demonstrated that decision support systems based on data are essential in determining the best crop varieties, soil health prediction, and increasing agricultural productivity.

The authors of [5] the convergence of machine learning (ML), IoT-based systems, and pest identification in agriculture, to enhance the precision and efficiency of pest classification models. One such challenge highlighted is the lack of labeled datasets, which results in poor model generalization and poor accuracy during deployment in real-time. Some of the current research has also used deep learning methods, including YOLOv3, DPeNet, and CNN-based architectures, to detect pests and classify insects based on image data. Most of these systems are reliant on extensive datasets as well as cloud computing, which may not always be possible with respect to bandwidth, power, and latency limitations. Faced with dataset limitation challenges, numerous methodologies such as data augmentation, synthetic data, and transfer learning have been applied. The authors of [6] the intersection of machine learning (ML), IoT systems, and crop pest identification in agriculture, with the aim to improve the accuracy and effectiveness of pest classification models. One such challenge pointed out is the insufficiency of labeled datasets, which leads to poor model generalization and low accuracy when deployed in real-time. Some of the recent work has also employed deep learning techniques, such as YOLOv3, DPeNet, and CNN-based architectures, for pest detection and insect classification using image data. Most of these systems are dependent on large datasets as well as cloud computing, which might not always be feasible in terms of bandwidth, power, and latency constraints. Having faced dataset limitation issues, many methodologies like data augmentation, synthetic data, and transfer learning have been used. The authors [7] a range of available mobile applications that are intended to assist agricultural work and finds a number of important limitations. Present applications usually tackle single issues like irrigation, pest management, crop care, or pricing—but do not offer an integrated, one-stop solution for farmers. Applications such as IFFCO Kisan provide market prices and farming advice, whereas others such as E-Agro and other M-apps concentrate on direct sales and cutting out intermediaries. The authors [8] the urgent issues of sustainable agriculture in developing nations, including climate change, poor farming resources, and low youth engagement in agriculture. Low productivity of crops due to skill deficiency, weak marketing system, and information gaps among novice or smallholder farmers have been some of the concerns raised in research. The authors [9] the farmers and the wholesalers can make a new account with farmer and the wholesalers can make a new account with address and other information. Once they make an account, they can log in with their credentials. Only the registered user as farmer can make an auction.

While initiating an auction, the farmer must describe different details of the product and the duration of must describe different details of the product and the duration of auctions, and put a bid on an auction which he believes is good and remunerative. The authors [10] the farmers and the wholesalers can make a new account with farmer and the wholesalers can make a new account with address and other information. Once they make an account, they can log in with their credentials. Only the registered user as farmer can make an auction. While initiating an auction, the farmer must describe different details of the product and the duration of must describe different details of the product and the duration of auctions, and put a bid on an auction which he believes is good and remunerative. The authors [11] empower smallholder farmers through better access to information, market linkages, financial inclusion, resource management, and extension services. Mobile applications give real-time weather alerts, prices of crops, and best agricultural practices, resulting in better decision-making. Farmer-buyer direct connections minimize middlemen, resulting in fairer prices. Digital banking and access to credit improve financial security. Water and fertilizer tracking tools reduce wastage, improving efficiency. The authors [12] Literature review, case studies, and data analytics are combined in an assessment of the contribution of mobile apps toward raising the productivity of agriculture. Access to information, market linkages, financial inclusion, resource management, and extension services are areas that the research is concentrated on. The authors [13] use machine learning and natural language processing (NLP) to forecast agricultural commodity prices and supply real-time information to farmers in their local languages. Historical market trends are collected and analyzed with ARIMA, SARIMA, and RNN models for forecasting prices. A voice-based chatbot, utilizing NLP methodologies, is suggested to enable farmer interaction in Kannada. The authors [14] a web application to forecast agricultural commodity prices based on Long Short-Term Memory (LSTM), a Recurrent Neural Network (RNN) model. Historical price data were gathered from India's National Agriculture Market (eNAM) and preprocessed with Pandas and Scikit-learn. The LSTM model was trained on 80% of the dataset and tested on the remaining 20% to forecast daily, weekly, and monthly prices. The author [15] uses a qualitative research method to investigate the influence of e-commerce on the agricultural supply chain. It discusses available literature on supply chain efficiency and incorporates results from past studies. The research methodology centers on building agricultural supply chain models, studying the influence of e-commerce platforms in linking farmers, suppliers, distributors, and consumers.

III. METHODOLOGY

The creation of Fresh Roots, an Android-driven mobile application aimed at enabling agricultural seed trading among farmers and traders, followed a formal agile development methodology to have a user-driven, scalable, and resilient platform. This segment outlines the system architecture, data modeling, user requirement analysis, development process, and quality assurance strategies, thereby offering a systematic framework for designing and developing the application. Fresh Roots uses a client-server design to provide a real-time and scalable platform for farm trade. The client, written in Kotlin and Android Jetpack components, is the user interface and performs local data processing. Some of the most important Jetpack components used are Navigation for smooth fragment changes, View Binding for optimal UI element access, and Recycler View for rendering dynamic lists. The backend utilizes Firebase, a cloud-hosted platform offering integrated services that specifically cater to the needs of the application. Firebase Authentication facilitates secure email-based user authentication, Firestore offers a NoSQL database with real-time data storage and synchronization, and Firebase Storage handles the uploading and downloading of seed listing photos. This supports real-time updating, which is critical to features like notifications and chat, where users need to see instant feedback from new listings or messages. Secure HTTPS connections allow for client-server communication, while Firestore's local caching provides partial offline capability, including the ability to view listings already loaded. Firebase's cloud infrastructure provides for scalability, allowing for an increasing user base across various agricultural regions.

The Firestore database is designed to minimize data storage, retrieval, and real-time synchronization, with hierarchical organization based on the functionalities of the application. The data model consists of a number of main collections. The Stock Collection, found at stock/buyer/seeds, holds seed listings with fields such as description (textual product information), farmer (listing farmer name), seed (type of seed), quantity (integer), price (integer), image (image path in Firebase Storage), farmerId (unique identifier for farmer), and timestamp (server-generated for sorting by recency). The Users Collection, under users/, has sub collections for user-related data: notifications to hold farmer subscriptions, notification_ list to hold active notifications with columns itemId, seed, farmer, and status (boolean for display), cart to hold shopping cart items with columns stockId, quantity, totalPrice, and purchased (boolean for purchase status), and chat_contacts to list participants in chat with userId and fullName. The Chat Rooms Collection, at chat_rooms, stores conversation metadata, i.e., participants (array of user IDs), lastMessage, and timestamp. This design is optimized for querying, e.g., filtering on farmerId or sorting by timestamp, and utilizes Firestore's snapshot listeners to provide real-time updates, keeping the application in sync with the newest data.

VI. IMPLEMENTATION

Implementation of Fresh Roots, an agricultural seed trading Android app, entailed building essential features using Kotlin, Android Jetpack, and Firebase. Below are the technical implementations of user authentication, listing of products, store and search functionality, cart management, notification system, chat feature, and performance optimizations for a smooth and efficient user experience for buyers and farmers. The authentication subsystem grants secure entry to Fresh Roots using email-based login and signup. The Login Fragment and Signup Fragment handle the process, utilizing Firebase Authentication to authenticate user credentials fig 2 (a). Users enter their password and email, with client-side validation applied to check for valid email addresses and password lengths.

If authentication is successful, the application transitions to the fig 2(b) Home Fragment via the Navigation Component, which facilitates seamless transitions between screens. View Binding is used to access UI elements efficiently, reducing boilerplate code. In case of authentication failures, e.g., incorrect password or invalid email, users are given clear error messages through Toast notifications, which lead them to fix things. This approach creates a secure and convenient entry point to the application that safeguards user information in a marketplace scenario.

The UploadFragment allows farmers to post seed listings by uploading photos and entering product information. Farmers choose photos from their device, which are previewed through the Picasso library to guarantee effective rendering. They enter information such as description, farmer name, seed type, quantity, and price, with validation checks to ensure all fields are filled and numeric values are positive. Images are uploaded to Firebase Storage, and related metadata is saved in the Firestore stock/buyer/seeds collection, with a server-generated timestamp for ordering. Fig 3 Once uploaded successfully, the form is cleared, enabling farmers to easily add more listings. This functionality makes listing easier, making it convenient for farmers with minimal technical knowledge while maintaining data consistency.

The StoreFragment displays seed listings in a grid-based two-column layout with RecyclerView set up using a GridLayoutManager to maximize screen real estate for navigation. The ItemAdapter links data to views, making listing items clickable to navigate to detailed views via the Navigation Component. A search field input permits dynamic filtering of listings as users input queries, where the ItemAdapter refreshes real-time displayed items. Entries are fetched from Firestore's stock/buyer/seeds collection and ordered by timestamp to favor recent entries. Firestore snapshot listeners maintain the user interface up to date with real-time changes, e.g., new entries or edits, providing an interactive and responsive shopping experience for buyers.

CartFragment controls the shopper's shopping cart, showing items in a RecyclerView with a GridLayoutManager for a visually pleasing layout. The CartAdapter handles user actions to buy or delete items, updating the users//cart collection in Firestore in like manner. Only non-purchased items are shown, keeping the cart up to date with current choices. Fig 4 Snapshot listeners ensure the user interface is synchronized with Firestore in real time, so additions and deletions show up instantaneously. Error handling prevents users from going unnoticed in the event of failures, like unsuccessful database updates, by displaying Toast messages. It simplifies the buying process and offers buyers a simple method for controlling their cart. The HomeFragment uses a notification system to inform users of fresh seed listings by farmers they subscribe to. The subscriptions are stored in the users//notifications subcollection, and new listings create entries in the notification_list subcollection, with itemId, seed, farmer, and status (a boolean visibility indicator) fields. The NotificationAdapter shows active notifications in a RecyclerView, with an option to close and dismiss notifications by setting their status to false. A badge on the home screen shows the number of active notifications, refreshed in real time through Firestore snapshot listeners. This feature increases user engagement by keeping buyers aware of relevant new listings, prompting timely interactions.

The ChatFragment allows users to message each other directly, enabling negotiations or inquiry on products. Chat rooms are established under the Firestore chat_rooms collection where a unique identifier is generated by concatenating the participant user IDs in lexicographical order to maintain consistency across devices. Fig 5 (a) The ChatAdapter presents a list of contacts in a RecyclerView with the last message and timestamp for each conversation obtained from Firestore. Touching a contact opens the ChatScreenFragment, where users may send and receive messages. Snapshot listeners provide real-time updates for the contact list and message previews so that the chat is interactive and responsive. A number of optimizations were made to improve the performance of the application, especially for rural area users with limited network access. Picasso library resizes and caches images to minimize load times and memory usage. Firestore offline support caches data on the local machine, allowing users to access listings and notices even without the active network connection. RecyclerView uses the ViewHolder pattern and DiffUtil to reduce unnecessary UI redraws, providing smooth scrolling on the store and fig 5 (b) cart screens. Firestore queries are optimized with proper indexing to minimize latency, and snapshot listeners are handled judiciously to avoid excessive data retrieval. These optimizations make FreshRoots responsive and accessible, providing a stable user experience across varying network conditions.

V. CONCLUSION AND FUTURE SCOPE OF WORK

The Fresh Roots application is an innovative platform that revolutionizes the agricultural supply chain by bridging farmers, middlemen, and companies seamlessly. Through the use of sophisticated technologies like Angular JS, Flutter, Kotlin, MongoDB, Node.js, Firebase, and real-time synchronization, the app offers a strong, user-friendly, and scalable solution for the agriculture marketplace. Flutter and Kotlin provide cross-platform compatibility and native performance, delivering a smooth and responsive experience across iOS and Android devices, while Firebase improves real-time data management, authentication, and push notification features for an uninterrupted user experience. Key features such as digital contract management push notifications and real-time updates simplify crop listings, increase transparency, and enable timely deliveries. NoSQL database, bolstered by Firebase's cloud infrastructure, and cloud storage facilitate smooth media management, enabling farmers to promote their produce by way of high-resolution images and videos. Recurrent Neural Networks (RNN) integration streamlines crop classification, predictive analysis, and data processing, enhancing the accuracy and reliability of the platform. Fresh Roots establishes trust by virtue of secure digital contracts that empower middlemen to process transactions and obligations efficiently.

By reducing inefficiency in the supply chain for agriculture, Fresh Roots stimulates economic growth, supports sustainability, and enables stakeholders with what it takes to thrive in the competitive marketplace. This forward-thinking platform not only addresses challenges for today but establishes the platform on which to push forward agricultural technological innovations in the future, propelling Fresh Roots as an innovator of digital transformation in the industry. In order to further advance the Fresh Roots app, upcoming developments will include the addition of sophisticated features that will further improve user interaction and platform efficiency. One such area of research includes the incorporation of a time-based post expiration system, whereby listings of crops expire automatically after a predetermined period of time, say 10 days, in order to keep the feed fresh and pertinent. This capability will need to be designed with sensitivity to ensure convenience for users without compromising data retention, possibly through user-configurable expiration times. Plans also call for the inclusion of machine learning algorithms to deliver personalized crop suggestions and market trend forecasts, helping farmers and businesses make better decisions. Another high priority is extending the platform's analytics dashboard to provide real-time visibility into supply chain performance and user activity. In addition, utilizing blockchain technology for better security and traceability in digital contracts would further enhance trust among the stakeholders. These features are expected to make Fresh Roots a complete, future-proof solution for the agricultural ecosystem.

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