KISAN BUDDY

A PROJECT REPORT

Submitted by,

Mr. MOHAMMED ISMAIL	**20211CSE0784**
Mr. SHAIK AKRAM	**20211CSE0783**
Mr. BANDI RAGHAVENDRA	**20211CSE0762**

Under the guidance of,

Dr. VAIRAVEL CHENNIYAPPAN

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

At

PRESIDENCY UNIVERSITY

BENGALURU

JANUARY 2025

PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Project report **"KISAN BUDDY"** being submitted by "MOHAMMED ISMAIL, SHAIK AKRAM, BANDI RAGHAVENDRA" bearing roll number(s) "20211CSE0784, 20211CSE0783, 20211CSE0762" in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a bonafide work carried out under my supervision.

20/11/2025

Dr. VAIRAVEL CHENNIYAPPAN
Assistant Professor
School of CSE
Presidency University

20/11/25

Dr. ASIF MOHAMMED H.B
Asso. Prof& HoD
School of CSE
Presidency University

Dr. L. SHAKKEERA
Associate Dean
School of CSE
Presidency University

Dr. MYDHILI NAIR
Associate Dean
School of CSE
Presidency University

Dr. SAMEERUDDIN KHAN
Pro-Vc School of Engineering
Dean -School of CSE&IS
Presidency University

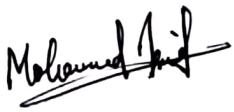
PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **KISAN BUDDY** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering**, is a record of our own investigations carried under the guidance of **Dr. VAIRAVEL CHENNIYAPPAN, Asst. Prof, School of Computer Science and Engineering, Presidency University, Bengaluru.**

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

NAME	ROLL NO	SIGNATURE
MOHAMMED ISMAIL	20211CSE0784	
SHAIK AKRAM	20211CSE0783	
BANDI RAGHAVENDRA	20211CSE0762	

ABSTRACT

The Kisan Buddy project is a mobile application designed to empower Indian farmers by addressing critical challenges such as limited market access, outdated market prices, and inefficient trade systems. With agriculture being the backbone of India's economy, improving farmers' accessibility to real-time data and optimized trade mechanisms is essential for sustainable growth. Despite existing applications, research highlights significant gaps, including a lack of real-time market updates, user-friendly interfaces, and robust decision-making support. Kisan Buddy bridges these gaps by leveraging Firebase Authentication for secure login and registration, Firebase Realtime Database for seamless data management, and Firestore for structured, scalable data storage. The app offers features like real-time mandi price updates, personalized cost estimation, and intuitive navigation to nearby mandis through Google Maps integration. Methodologically, the application integrates advanced mobile technologies, ensuring offline functionality and multilingual support to cater to the diverse needs of Indian farmers. Early testing has demonstrated improved decision-making, market transparency, and accessibility, fostering better economic outcomes. By addressing issues such as market inefficiencies and digital literacy barriers, the app aligns with the United Nations' Sustainable Development Goals, particularly those related to economic growth and reduced inequalities. Kisan Buddy represents a transformative solution, combining innovative technology with user-centric design to enhance agricultural productivity and profitability. This research underscores the potential of digital tools in revolutionizing rural livelihoods, offering a scalable and adaptable framework for improving the socio-economic conditions of farmers in India. The findings highlight its ability to bridge existing gaps and its role in advancing sustainable agricultural practices.

ACKNOWLEDGEMENT

First of all, we indebted to the **GOD ALMIGHTY** for giving me 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 Deans **Dr. Shakkeera L and Dr. Mydhili Nair,** School of Computer Science and Engineering, Presidency University, and **Dr. Asif Mohammed H.B**, Head of the Department, School of Computer Science and Engineering, Presidency University, for rendering timely help in completing this project successfully.

We are greatly indebted to our guide **Dr. Vairavel Chenniyappan, Asst.Prof** and Reviewer **Dr. Riyazulla Rahaman J, Asst.Prof**, School of Computer Science and Engineering, Presidency University for his 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 **Mr. Amarnath J.L and Dr. Jayanthi. K** and Git hub coordinator **Mr. Muthuraj.**

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

Mohammed Ismail

Shaik Akram

Bandi Raghavendra

LIST OF FIGURES

TABLE OF CONTENTS

CHAPTER-1
INTRODUCTION

1.1 Background

Agriculture has long been the backbone of India, playing a pivotal role in the nation's economy and sustaining a significant portion of its population. It continues to be the primary source of livelihood for millions, especially in rural areas, where farming is deeply intertwined with culture and tradition. Despite its importance, the agricultural sector in India has faced persistent challenges in adopting modern practices and integrating with digital technologies. These challenges often arise from a lack of access to real-time market information, limited technological infrastructure and difficulties in logistics, such as transporting crops to the nearest mandi (market).

The rapid advancements in mobile technology, cloud computing, and location-based services provide opportunities to address these issues. Recognizing these opportunities, *Kisan Buddy* was conceptualized as an Android-based mobile application to simplify the lives of farmers by solving critical logistical and informational challenges. Built using Firebase for secure user authentication and real-time data storage, combined with Google Maps for location services, the app enables farmers to make well-informed decisions regarding crop prices and market access.

Kisan Buddy bridges the technological gap in the agricultural sector by creating a centralized platform that integrates features such as user registration, real-time market mapping, and cost optimization. By leveraging these technologies, the app empowers farmers with the tools they need to improve their economic prospects while reducing inefficiencies in the supply chain**.**

1.2 Problem Statement

Agriculture in India faces a multitude of challenges despite being the backbone of the country's economy and livelihood for a significant portion of the population. Farmers often encounter difficulties in accessing reliable market information, determining the best locations to sell their produce, and optimizing costs associated with transactions. The traditional mandi system, while pivotal, suffers from inefficiencies such as a lack of transparency, inadequate

communication channels, and unpredictable pricing. Farmers frequently incur unnecessary expenses due to poor decision-making, as they lack tools to evaluate the proximity of mandis or compare transactional costs effectively. Additionally, there is a limited integration of modern technological solutions to address these challenges, leaving many farmers reliant on outdated methods.

Another major issue is the lack of a centralized platform for farmers to manage their agricultural produce and connect with buyers. Often, small-scale farmers, who form the majority in India, face difficulties in marketing their crops, negotiating fair prices, and reducing transportation overheads. Furthermore, the absence of digital records and tools to streamline the farming ecosystem leads to inefficiencies and reduces profitability. These persistent issues highlight the pressing need for a solution that is not only technologically advanced but also accessible and user-friendly for farmers in rural areas.

1.3 Need for the Project

The *Kisan Buddy* app was developed to address a critical challenge in Indian agriculture: the lack of timely, accurate, and accessible information about market conditions. Despite advancements in mobile technology, many farmers still struggle to access real-time pricing, locate the best markets for their produce, and make informed decisions about sales. This application seeks to bridge this gap by providing a user-friendly platform that makes it easier for farmers to access reliable, up-to-date information about nearby mandis, cost estimates, and transaction recommendations.

1.3.1 Addressing Market Instability

In many rural areas, farmers face significant challenges when selling their crops due to market instability, fluctuating prices, and the involvement of middlemen. The *Kisan Buddy* app addresses these issues by providing real-time pricing and market trends, empowering farmers to make decisions based on the latest data. This feature ensures that farmers can maximize their profits by avoiding situations where they might be forced to sell at lower prices due to lack of information or market knowledge.

1.3.2 Improving Access to Agricultural Markets

Access to nearby mandis and fair market prices remains a significant issue for many farmers,

particularly those in remote or underdeveloped areas. The *Kisan Buddy* app helps farmers find the nearest mandis, obtain accurate directions, and compare prices across different markets. This ensures that farmers can make well-informed choices, even if they are unfamiliar with the area or the local agricultural market landscape.

1.3.3 Enhancing Transaction Transparency

Another major challenge farmers face is the lack of transparency in agricultural transactions. The app's pricing estimates and market recommendations help mitigate this problem by providing data on crop costs and trends, allowing farmers to sell their produce at fair prices without being exploited by middlemen. By offering this transparency, the app enables farmers to retain more control over their sales and financial decisions.

1.3.4 Empowering Farmers with Technology

While mobile technology has revolutionized many sectors, its impact on agriculture remains underutilized in many parts of India. *Kisan Buddy* aims to fill this gap by offering an easy-to-use tool that allows farmers to harness the power of technology to make smarter decisions. By providing real-time information and actionable insights, the app fosters greater autonomy and financial independence for farmers.

1.4 Scope of the Project

Kisan Buddy aims to transform the Indian agricultural landscape by providing a comprehensive digital platform that empowers farmers with technology-driven solutions. The application is designed to address key challenges such as mandi selection, cost optimization, and market accessibility. With features like Firebase-backed real-time data management, Google Maps integration for location-based decision-making, and a streamlined user authentication system, the project ensures a seamless and efficient experience for farmers.

The scope of *Kisan Buddy* extends beyond simply connecting farmers with mandis, it creates a holistic ecosystem where farmers can input the details of their crops, including type, quantity, and cost, and instantly get recommendations for the nearest mandi with the least transactional cost. This not only helps farmers save time and money but also allows them to make data-driven decisions for better profitability.

The use of Firebase Fire store and Realtime Database ensures secure and efficient storage of user and crop data, enabling farmers to maintain digital records of their produce and transactions. The integration of Firebase Authentication enhances the security of user accounts, ensuring a safe and trustworthy platform for all stakeholders. Additionally, the scalability of the application allows for future enhancements, such as integrating weather forecasts, crop yield predictions, or even online marketplaces for direct buyer-seller interactions.

By providing a bridge between farmers and technology, *Kisan Buddy* not only addresses immediate challenges but also lays the groundwork for a digitally inclusive agricultural sector in India. The project has the potential to significantly enhance the productivity, profitability, and overall well-being of farmers, contributing to the broader goals of rural development and economic growth in the country.

CHAPTER-2
LITERATURE SURVEY

The *Kisan Buddy* project aims to develop a mobile application that addresses critical challenges faced by farmers, such as limited market access, lack of real-time information, and inefficient trade systems. This literature survey examines various studies, reports, and research papers that provide insights into similar initiatives, technological frameworks, and their impact on agriculture. The analysis is organized into themes highlighting relevant findings, methodologies, and implications.

2.1 Agricultural Networking and Online Platforms

Agarwalla [1] discusses the *Kisan Network*, a digital platform aimed at connecting farmers directly to buyers, effectively removing the role of intermediaries. The platform enhances transparency and promotes fair pricing for agricultural products, thus fostering trust between farmers and buyers. The study highlights the potential of online platforms in reducing transaction costs and improving market efficiency. A key takeaway from this research is the need for localized and language-friendly interfaces to ensure wider adoption among rural communities, where language and digital literacy barriers exist. These findings are critical for the *Kisan Buddy* project, which aims to provide farmers with a platform that bridges the gap between producers and buyers.

Mohan et al. [6] present a case study of the *Farmers Buddy* application, which includes features such as product listings, buyer-seller communication, and transportation sharing. The study demonstrates that these features significantly enhance farmers' ability to connect with broader markets and improve profitability. It also highlights the importance of integrating real-time updates on pricing and logistics to make trading more efficient and farmer-friendly. These insights align with the objectives of *Kisan Buddy*, which also seeks to optimize market access and trade interactions through the use of modern technology.

Both studies underscore the importance of digital platforms in empowering farmers by offering them access to a transparent and efficient marketplace. The insights gained emphasize the need for seamless integration of user-friendly interfaces, real-time updates, and trust-building mechanisms within *Kisan Buddy*.

2.2 Role of Mobile Technology in Agriculture

Mobile technology has become a cornerstone in modern agriculture, as highlighted by Kambale et al. [3]. Their research emphasizes the functionalities provided by agricultural applications, including price tracking, weather forecasting, and crop advisory services. The study argues that these features enable farmers to make well-informed decisions, improving productivity and reducing risks. A particularly notable finding is the need for designing user-centric applications tailored for rural populations, many of whom are first-time technology users.

In a related study, Nimje and Wankhede [7] analyse the *Farmer Buddy* app, which focuses on addressing key challenges such as delayed payments and insufficient market visibility. Their findings reveal that mobile applications can play a pivotal role in bridging the gap between farmers and the market, providing timely information on pricing and market trends. These apps also facilitate financial inclusion by connecting farmers to digital payment platforms, thereby reducing dependency on cash transactions and increasing economic resilience.

For the *Kisan Buddy* project, these insights suggest that the integration of key features such as real-time price updates, weather forecasts, and digital payment options is essential to address the specific needs of farmers. Moreover, a user-friendly interface designed for first-time users in rural areas would be crucial for adoption and success.

2.3 Smart Agriculture and Emerging Technologies

Oteyo et al. [8] provide an overview of mobile applications for smart agriculture, emphasizing the role of emerging technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and machine learning. These technologies enable predictive analytics, precision farming, and resource optimization by offering real-time insights into crop health, soil conditions, and weather patterns. For instance, IoT sensors can monitor soil moisture levels, while AI-driven models can predict pest outbreaks, allowing farmers to act proactively. The study demonstrates that such technologies can lead to reduced operational costs, increased crop yields, and more efficient use of resources. For *Kisan Buddy*, integrating predictive analytics and location-based services can significantly enhance its functionality. Features such as AI-driven weather predictions and crop advisories would help farmers make informed decisions, thereby improving productivity and minimizing resource wastage.

Incorporating these advanced technologies into *Kisan Buddy* would align the app with global trends in smart agriculture, making it a comprehensive solution for Indian farmers seeking to improve efficiency and profitability in their operations.

2.4 Firebase and Mobile Application Development

Firebase is a powerful backend-as-a-service (BaaS) solution that offers a range of features critical for mobile application development. Studies by Khawas and Shah [4] and Saraf et al. [10] explore Firebase's capabilities, including real-time database management, user authentication, and cloud storage. These features make it an ideal choice for applications that require scalability, security, and efficiency.

The real-time database feature of Firebase enables applications to handle large datasets, such as user profiles, mandi prices, and transactional records, with minimal latency. This is particularly important for *Kisan Buddy*, where users require instant access to critical data such as market prices and transaction updates. Additionally, Firebase's offline capabilities ensure seamless functionality even in areas with inconsistent internet connectivity, which is a common challenge in rural India.

The studies also highlight Firebase’s cross-platform compatibility, which ensures a consistent user experience across different devices and operating systems. These attributes make Firebase a robust and reliable backend solution for *Kisan Buddy*, supporting its goal of providing a seamless and efficient platform for farmers.

2.5 Impact of Mobile Applications on Farming Systems

Mobile applications have had a profound impact on farming systems, as demonstrated by Kumari [5]. The study evaluates the role of agricultural apps in enhancing decision-making, market access, and financial inclusion. Apps that provide real-time information on market prices, government schemes, and weather updates enable farmers to plan and execute their activities more effectively. The findings reveal that such apps not only improve operational efficiency but also contribute to the economic empowerment of farmers.

Gorde et al. [9] further explore the potential of mobile applications in transforming the livelihoods of farmers. Their research highlights the integration of value-added services, such

as insurance, subsidies, and notifications about government policies, as critical features that address the challenges faced by small and marginal farmers. The study also emphasizes the importance of multilingual support and intuitive interfaces to cater to diverse user groups, a consideration that is particularly relevant for *Kisan Buddy*.

These findings underline the importance of designing *Kisan Buddy* as a comprehensive platform that goes beyond basic functionalities to include features like value-added services, intuitive design, and multilingual support. Such an approach would ensure that the app meets the diverse needs of its target audience while promoting inclusivity and accessibility.

CHAPTER-3

RESEARCH GAPS OF EXISTING METHODS

The following section identifies and analyzes the gaps in existing methods used in mobile applications for agriculture, particularly those addressing farmer-centric needs such as crop management, market accessibility, and cost estimation. Despite advancements in technology and increasing adoption of digital tools, several critical gaps remain that hinder the optimal use of such solutions.

3.1 Limited Integration of Real-Time Data

3.1.1 Lack of Real-Time Market Updates

Existing agricultural mobile applications often fail to provide accurate and timely information about mandi (market) prices. Many platforms rely on static or periodically updated databases, which results in outdated pricing data. Farmers require real-time mandi price updates to make informed decisions about selling their produce, maximizing their profits.

3.1.2 Poor Integration of Weather and Geospatial Data

While certain applications provide weather predictions, they do not integrate real-time geospatial data effectively. Accurate mapping and live updates using tools such as the Google Maps API are still underutilized. This limits farmers' ability to plan their activities, such as irrigation, transportation of produce, and assessing nearby mandi locations.

3.2 Limited Accessibility and User-Friendliness

3.2.1 Poor User Interface for Farmers

A majority of existing solutions suffer from poor design, making them difficult for farmers to use, especially those with limited technical literacy. Applications often do not prioritize user experience, leading to frustration and lower adoption rates.

3.2.2 Language and Localization Barriers

Many applications are not designed with multilingual support, creating accessibility issues for farmers who speak regional Indian languages. This gap leaves out a significant portion of the user base, particularly in rural India where English proficiency is lower.

3.3. Lack of Cost Estimation and Financial Recommendations

3.3.1 Absence of Predictive Cost Models

Existing systems fail to provide personalized cost estimations for farming activities, including crop sowing, harvesting, and transportation. Farmers often rely on approximations or outdated methods, which result in poor financial planning.

3.3.2 Limited Decision-Making Support

Most applications lack advanced analytics or AI-based tools to recommend cost-effective practices or identify trends. Farmers require data-driven recommendations on where to sell their crops for higher returns or how to optimize expenses for better profitability.

3.4. Incomplete Connectivity with Agricultural Mandis

3.4.1 Lack of Nearby Mandi Detection Features

Although platforms such as APEDA's Farmer Connect offer mandi-related information, the integration of nearby mandi detection remains inefficient. Tools like Google Maps APIs are often underutilized, making it difficult for farmers to identify the most accessible mandi based on distance, cost, and crop demand.

3.4.2 Inefficient Mandi Transaction Systems

Current solutions do not streamline mandi-based transactions effectively. For example, farmers are unable to pre-schedule visits, manage appointments, or receive real-time updates about demand and procurement rates. This inefficiency often leads to delays and financial losses.

3.5. Limited Adoption of Mobile Technologies

3.5.1 Underutilization of Advanced Mobile Features

Existing applications do not fully harness mobile capabilities such as GPS, push notifications, or cloud-based storage systems like Firebase. This leads to limited functionality and prevents the creation of a comprehensive, user-friendly solution tailored to the needs of farmers.

3.5.2 Lack of Offline Functionality

Most existing methods require continuous internet connectivity, which poses a challenge for farmers in remote areas with limited network access. Offline access to essential features, such

as crop details, price estimations, and mandi information, remains a significant gap.

3.6. Limited Integration of Data Analytics and AI

3.6.1 Insufficient Predictive Analytics for Crop Management

While some platforms offer basic crop management tools, they lack advanced predictive analytics. Machine Learning (ML)-based models for yield prediction, crop disease detection, and resource optimization remain underdeveloped.

3.6.2 Lack of AI-Based Personalized Recommendations

Farmers often require personalized suggestions regarding optimal mandi choices, crop pricing, and cost management. Existing systems do not incorporate AI algorithms that analyze historical data and provide actionable insights tailored to individual users' needs.

3.7 Poor Connectivity with Government Schemes and Policies

Existing agricultural applications fail to bridge the gap between farmers and government initiatives. Many farmers remain unaware of subsidy schemes, insurance options, or minimum support prices (MSP) due to a lack of centralized, easy-to-access information.

CHAPTER-4
PROPOSED METHODOLOGY

This section outlines the systematic approach employed in developing *Kisan Buddy*, an Android-based application designed to assist Indian farmers in making informed decisions about crop selling by leveraging mandi data, profitability analysis, and navigation tools. The methodology is divided into distinct sections that collectively detail the framework, tools, and processes adopted during the project development.

4.1 System Overview

The *Kisan Buddy* system is an integrated solution designed to address the challenges faced by Indian farmers in accessing reliable market data and making profitable decisions about crop sales. The system provides recommendations based on mandi profitability and crop-related data. It is structured into three main components: frontend, backend, and data flow, ensuring seamless interaction between the user interface and the backend systems.

The frontend, developed using XML layouts and Java-based activities, delivers an intuitive interface for user interaction. The backend utilizes Firebase services, including Firestore for data storage and Authentication for secure login and registration. Google Maps is integrated for navigation, enabling farmers to locate recommended mandis easily. The modular design of the system ensures scalability and facilitates future enhancements, making it adaptable to evolving user needs.

4.2 Research Design

The research methodology for this project employs a mixed-method approach, combining quantitative data analysis with qualitative insights from farmer feedback. This ensures the solution is both data-driven and user-centric.

Key objectives of the research design include:

i. **Accuracy in Data Management:** Ensuring the use of reliable, up-to-date mandi price data sourced from credible government platforms.
ii. **Scalability and Integration:** Designing a system that supports dynamic data management and incorporates modern tools like Firebase and Google Maps.

iii. **User-Centric Development:** Prioritizing features that align with the real-world challenges faced by farmers, such as profitability computation and intuitive navigation.

The architecture is modular, with a clear separation of concerns across components, facilitating efficient development, testing, and deployment.

4.3 Data Collection

The primary data source for the project is the *Open Government Data Platform India*. Specifically, the dataset titled *Current Daily Price of Various Commodities from Various Markets (Mandi)* "https://www.data.gov.in/resource/current-daily-price-various-commodities-various-markets-mandi", provides real-time mandi prices across states in India. Key fields in the dataset include market, commodity, variety, grade, arrival date, minimum price, maximum price, and modal price.

4.3.1 Data Transformation

The dataset, originally in CSV format, was pre-processed to make it compatible with the app's backend system. The data was cleaned, validated, and converted into a structured format before being uploaded to the Firebase Firestore database.

This transformation involves:

i. **Data Cleaning**: Removing duplicates, handling missing values, and standardizing field names to ensure consistency.
ii. **Data Normalization**: Converting prices to a uniform unit and ensuring all numeric fields had valid entries.
iii. **Data Structuring**: Creating JSON-like objects for Firestore integration. For instance, each mandi record includes fields for state, district, market, crop name, and price.

To make the data suitable for integration with the application, it was processed and uploaded to Firestore. This ensures real-time access and compatibility with the application's backend.

Two key Firestore collections manage the data:

i. **MandisData Collection**: Contains records for all mandis, including their state, district, crop details, and price information. This collection supports real-time querying

for recommendations based on user input.

ii. **Crops Collection**: Stores crop details entered by users through the app, such as the crop name, quantity, and cost. This data is used to compute personalized recommendations.

By storing the data in Firestore, the system ensures scalability, real-time access, and efficient querying, critical for an interactive application like *Kisan Buddy*.

4.4 Data Analysis and Processing

Data analysis and processing are at the core of the *Kisan Buddy* application's functionality, enabling the app to generate meaningful recommendations for farmers. This involves multiple steps to process raw mandi data and derive actionable insights.

4.4.1 Profitability Computation

A key aspect of data analysis is determining the profitability of each mandi for a farmer. The profitability formula used is:

$$\text{Profit} = (\text{Mandi Price} - \text{User Crop Cost}) \times \text{Quantity}$$

- **Mandi Price**: Fetched from the MandisData collection in Firestore.
- **User Crop Cost**: Entered by the farmer in the *CropActivity.*
- **Quantity**: The amount of the crop (in quintals) entered by the farmer.

This computation allows the app to rank mandis based on potential profit. Mandis with higher profit margins is prioritized in the recommendation list.

4.4.2 Dynamic Filtering and Sorting

To make the data user-friendly and actionable, the app supports:

i. **Filtering**: Farmers can filter mandis by:
   - **State**: To find local markets.
   - **Crop**: To narrow down results to specific commodities.
   - **District**: For geographic specificity.

ii. **Sorting**: Mandis are sorted based on profitability in descending order, ensuring the

most lucrative options are displayed first.

4.4.3 Real-Time Querying

Fire store's querying capabilities are utilized to fetch and filter data dynamically. For example, when a farmer enters their crop details and selects a state, the app queries the Firestore database for matching mandi records. This ensures that recommendations are generated in real time.

4.4.4 Data Validation

Before displaying mandi recommendations, additional validation steps are performed:

i. **Price Checks**: Ensures that the fetched mandi prices are within a reasonable range to avoid anomalies.
ii. **Geographic Matching**: Ensures that mandis displayed as "local" are genuinely within the selected state or district.

4.4.5 Historical Data Processing

The app maintains a local history of recently recommended mandis using SharedPreferences. This allows farmers to revisit their past choices easily. The history is updated dynamically to ensure relevance, with a cap on the number of records stored locally.

4.4.6 Enhanced Features in Data Analysis

To further enrich the user experience, the app includes:

i. **State-Specific Recommendations**: Priority is given to mandis within the farmer's state to reduce transportation costs and improve accessibility.
ii. **Cross-State Insights**: Mandis outside the state are also displayed but ranked lower unless their profitability significantly outweighs local options.
iii. **Interactive Visualization**: Recommendations are integrated with Google Maps, allowing farmers to navigate to the mandi seamlessly.

4.5 Firebase Integration

Firebase serves as the backbone of the *Kisan Buddy* application, providing a robust and scalable backend infrastructure. Leveraging Firebase Firestore, Firebase Authentication, and Firebase Realtime Database, the app ensures seamless data management, user authentication, and real-time updates.

4.5.1 Firestore Database

Firestore is utilized for storing and managing two key collections:

i. **MandisData Collection**: This collection contains records of over 8,300 mandis, each with fields such as state, district, market, crop name, and price. The structure allows efficient querying and filtering based on user inputs such as crop name, state, and district. The dynamic nature of Firestore enables the app to fetch real-time updates on mandi data whenever modifications occur.

ii. **Crops Collection**: Farmers' entered crop details, such as Crop Name, Quantity, and Cost, are stored in this collection. This data is later used to compute profitability and generate personalized recommendations.

4.5.2 Firebase Authentication

Firebase Authentication is employed to manage user login and registration. Using the email-password authentication method, farmers can securely create accounts and access personalized features. The authentication module ensures data integrity by associating user-specific data with unique user IDs. Error handling mechanisms are integrated to address issues like duplicate registrations or invalid credentials.

4.5.3 Firebase Realtime Database

- Real-Time Updates: Changes in mandi data or user inputs are immediately reflected in the app, eliminating delays.
- Efficient Queries: Advanced querying capabilities allow fetching of mandi data filtered by crop type, state, or district, ensuring rapid response times.

4.6 Mandi Recommendations and Navigation

The *Kisan Buddy* application prioritizes providing farmers with actionable insights through its robust recommendation and navigation system. This core functionality is built to analyse profitability for various mandis and guide farmers to the most advantageous markets.

The recommendation engine evaluates mandi profitability using the formula:

$$\text{Profit} = (\text{Mandi Price} - \text{User Crop Cost}) \times \text{Quantity}.$$

Farmers input essential details, such as crop name, quantity, and cost, in the *CropActivity*. The application then retrieves mandi data stored in Firebase Fire store's *MandisData* collection, calculates potential profits, and ranks mandis based on the highest profitability. The top mandi is highlighted as "Recommended", ensuring farmers receive the best possible options for selling their produce.

For accessibility, the navigation feature integrates with Google Maps to guide farmers to their chosen mandi. Upon selecting a mandi from the list, the app launches Google Maps with the mandi's location pre-loaded, offering step-by-step directions. This feature reduces logistical complexities, particularly for farmers exploring new mandis or interstate trade opportunities. By combining profitability-based recommendations with seamless navigation, *Kisan Buddy* empowers farmers to make data-driven decisions while simplifying the journey to mandis, ultimately enhancing their overall agricultural trade experience.

4.7 Technology Stack Components

The development of *Kisan Buddy* leverages the following technologies:

i. **Android Studio:** The primary development environment used to build the application.
ii. **Firebase Services:** Includes Authentication, Firestore, and Realtime Database for backend operations.
iii. **Google Maps:** Facilitates navigation to mandis directly from the application.
iv. **Java and XML:** Core programming and markup languages used for application logic and user interface design.

4.8 Justification of Methodology

The methodology adopted for this project ensures a balance between technical robustness and user-centric design. The use of Firebase for real-time data management and authentication enhances scalability and security. The modular architecture allows for efficient feature integration and future enhancements. By focusing on dynamic filtering, profitability computation, and intuitive navigation, the application addresses the key challenges faced by Indian farmers. Additionally, the integration of Google Maps ensures ease of use and accessibility. The proposed methodology is replicable, enabling future researchers or developers to build upon the existing framework to add new features or extend functionality.

CHAPTER-5
OBJECTIVES

The objectives of the *Kisan Buddy* project are focused on providing practical solutions for farmers through innovative technology and user-friendly design. These objectives are framed to address the key challenges faced by farmers in accessing mandi (market) information and making informed decisions. By developing a comprehensive mobile application, the project aims to enhance productivity, improve accessibility, and simplify the decision-making process for farmers.

5.1 Provide Real-Time Mandi Price Information

One of the core objectives of *Kisan Buddy* is to ensure farmers have access to accurate, real-time mandi price data for various crops across India. This information is sourced from reliable platforms like the Open Government Data (OGD) Platform India and stored in Firebase Firestore for seamless retrieval. Real-time data helps farmers understand market trends, anticipate price fluctuations, and choose the right time and place to sell their produce. This feature eliminates the reliance on outdated or second-hand information, fostering trust and transparency.

5.2 Facilitating Data-Driven Decision-Making

Kisan Buddy empowers farmers to make data-driven decisions by providing analytical insights based on mandi prices, crop data, and production costs. Using robust algorithms, the app processes user inputs such as crop type, cost, and quantity to identify the most profitable mandis. The integration of structured datasets ensures that recommendations are fact-based, reliable, and actionable. This objective is critical in enabling farmers to maximize their profits while minimizing risks.

5.3 Facilitate Profitability Computation for Farmers

Profitability computation is a central feature of the application. Using the formula Profit = (Mandi Price − User Crop Cost) × Quantity, the app ranks mandis based on their potential returns. This feature simplifies complex calculations for farmers, allowing them to visualize and compare the financial benefits of different markets. By automating the process, the app

saves time and ensures that farmers can focus on other aspects of their trade.

5.4 Seamless Integration of Navigation Services

Transportation is a significant challenge for many farmers, especially when visiting unfamiliar mandis. To address this, *Kisan Buddy* integrates Google Maps for navigation. This feature provides real-time, turn-by-turn directions to the selected mandi, ensuring that farmers can transport their produce efficiently. The integration reduces logistical complexities, saves travel time, and minimizes costs associated with transportation errors. Farmers can rely on the app to navigate through remote or urban areas with ease.

5.5 Maintain Historical Data for User Reference

Kisan Buddy includes functionality to maintain and display a history of mandis visited by the user. This historical data provides valuable insights, enabling farmers to track price trends, compare past profits, and make better-informed decisions. For instance, users can analyze whether a specific mandi consistently offers higher profits or if seasonal price trends influence their crops. This personalized feature adds depth to the app's utility and enhances its long-term value.

5.6 Dynamic Filtering and Sorting

To improve usability and engagement, the app offers dynamic filtering and sorting options. Users can filter mandis based on state, district, or crop type, and sort the results by profitability. These features ensure that the most relevant and lucrative options are displayed first, saving time and effort for farmers. By aligning with real-world needs, the filtering and sorting capabilities make the app highly practical and user-friendly.

5.7 Modern Technology for Scalability

Kisan Buddy is built using modern technologies to ensure scalability and robustness. Firebase Firestore serves as the cloud database, providing real-time synchronization and seamless data management. Firebase Authentication enables secure user login and profile management. The use of Android development tools allows for an intuitive interface and smooth performance. The app's architecture is designed to accommodate future enhancements such as multilingual support, broader geographical coverage, and integration with advanced analytics tools.

5.8 Farmer-Centric User Interface

The app's user interface is specifically designed with farmers in mind. Recognizing that many users may have minimal technical expertise, the app incorporates a simple and intuitive layout. Features such as clear instructions, responsive design, and intuitive navigation ensure accessibility for users of all backgrounds. Farmer feedback was incorporated during development to tailor the app's features to real-world challenges, ensuring that it remains relevant and practical.

5.9 Ensure Data Security and User Privacy

Data security and privacy are paramount in *Kisan Buddy*. Firebase Authentication ensures that only authorized users can access their profiles, while Firebase Firestore encrypts all stored data. The app complies with industry standards for data protection, safeguarding sensitive user information such as personal details and crop data. By prioritizing security, the app builds trust among users and ensures compliance with ethical data usage practices.

CHAPTER-6

SYSTEM DESIGN & IMPLEMENTATION

6.1 Introduction to System Design

System design is the foundational framework for transforming the functional requirements of the *Kisan Buddy* application into a robust and scalable system. It encompasses the structural and functional blueprint of the application, ensuring seamless integration between its front-end and back-end components. Designed with a farmer-centric approach, *Kisan Buddy* provides features such as real-time mandi price recommendations, profitability computations, and navigation services. The primary focus of the system design is to ensure ease of use, scalability, and high performance, catering specifically to the needs of Indian farmers who may face challenges such as intermittent internet connectivity. By leveraging modern technologies like Firebase, Android Studio, and Google Maps for navigation, the design ensures a streamlined user experience while maintaining the system's technical sophistication.

6.2 System Architecture

The architecture of the *Kisan Buddy* application is based on the Model-View-Controller (MVC) design pattern. This architectural choice provides a clear separation of concerns, allowing efficient management of data, logic, and presentation. It ensures maintainability, scalability, and modularity, making the system adaptable for future enhancements.

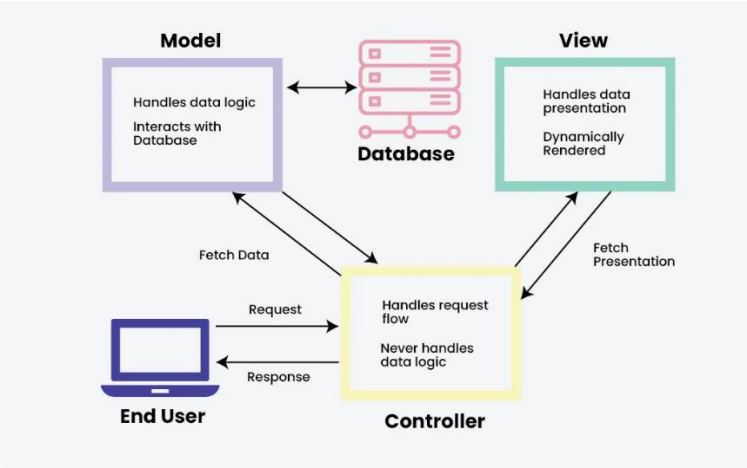


Figure 6.1: MVC Architecture

i. **Model:**

- The model layer is responsible for handling data and business logic.
- Firebase Realtime Database and Firestore serve as the primary data storage

solutions. These systems manage mandi details, user preferences, crop data, and recent recommendations.

- Computation logic for profitability, filtering, and sorting resides in this layer to maintain consistency in data processing.

ii. **View:**

- The view layer defines the application's user interface (UI) using XML-based layouts in Android Studio.
- The UI components are built with Material Design principles, ensuring simplicity, consistency, and accessibility for diverse users.
- Real-time updates are rendered in RecyclerViews and other interactive components, making the app responsive to user inputs.

iii. **Controller:**

- The controller layer acts as the intermediary between the model and the view.
- It processes user interactions, triggers updates in the model, and reflects changes in the UI. Activities such as MainActivity, ProfileActivity, and CropActivity handle the app's core functionality, ensuring data flow and user interactions are efficiently managed.

The architecture also integrates Firebase Authentication for secure login and registration, and Shared Preferences for storing recent recommendations locally. This layered approach enables a cohesive and robust system that balances functionality and performance.

6.3 Front-End Design

The front-end of the *Kisan Buddy* application is crafted to provide an intuitive and visually appealing interface while maintaining high usability standards. Built using Android Studio, the design adheres to Material Design Guidelines, ensuring consistency across devices and user familiarity with the app’s layout.

i. **User Interface (UI) Components:**

- **Login and Registration Screens:** The UI incorporates clean input fields with proper validation for user registration and login, powered by Firebase

Authentication. Visual feedback and error handling ensure smooth interaction.

- **Dynamic RecyclerViews:** Used extensively to display mandi data dynamically, RecyclerViews allow users to filter and sort data by state, crop name, and profitability. The design supports high responsiveness, with real-time updates as data changes.
- **Profile Management:** The profile section includes editable fields for name, city, email, and address. The layout is structured with TextInputLayouts to ensure a consistent and professional look.
- **Crop Details Entry Screen:** This screen allows farmers to input crop details, including quantity and cost. The design emphasizes simplicity, with drop-down menus and straightforward input fields.
- **Navigation Integration:** The mandi details page integrates Google Maps navigation. Buttons and clickable links lead to maps, enabling farmers to locate and reach their desired mandi easily.

ii. **Design Principles:**

- **Material Design Guidelines:** The app utilizes Material Design components, such as Floating Action Buttons, TextInputLayouts, and CardViews, ensuring a cohesive and modern aesthetic.
- **Colour Palette and Typography:** A farmer-friendly colour scheme is used, combining warm and inviting tones with high-contrast elements for readability. Fonts like Akaya Telivigala provide a blend of elegance and clarity.
- **Responsive Design:** XML layouts are optimized for various screen sizes and orientations, ensuring a consistent user experience across smartphones and tablets.

iii. **Localization:** While English is currently the primary language, the app structure supports localization. Additional languages can be integrated seamlessly using Android's localization framework to cater to regional preferences in the future.

iv. **Interactive Elements:** Buttons, spinners, and clickable cards enhance interactivity. For instance, farmers can navigate directly to mandis by clicking on cards displayed in the RecyclerView.

The front-end design combines user-centered aesthetics with functional efficiency, ensuring

farmers can easily access and utilize the app's features without any technical expertise. It bridges the gap between the technical complexities of the system and the simplicity required for effective farmer adoption.

6.4 Back-End Design

The back-end development of the *Kisan Buddy* application forms the backbone of its functionality, enabling seamless data storage, retrieval, and processing. The back-end system leverages Firebase services, including Firebase Authentication, Firebase Realtime Database, and Firestore, ensuring a secure, scalable, and responsive application.

i. **Data Storage and Management:**
   - **Firebase Realtime Database and Firestore:** Firebase Realtime Database stores crop details and recent recommendations for quick retrieval, while Firestore handles structured data, such as user profiles and mandi details. This dual approach ensures efficient data organization and scalability.
   - **SharedPreferences:** SharedPreferences is used for lightweight, device-local storage to maintain a history of recent mandi recommendations. This allows users to access their previous searches even when offline, enhancing user convenience.

ii. **Authentication:**
   Firebase Authentication secures user accounts with email and password credentials. It manages registration, login, and session maintenance, ensuring only authorized users can access personalized data. Security measures, such as real-time session validation and password encryption, protect sensitive information.

iii. **Application Logic:** The back-end includes algorithms for data processing, such as profitability computation and filtering logic. These algorithms are designed to provide farmers with actionable insights based on their crop inputs and mandi data.

iv. **Scalability and Real-Time Updates:** The Firebase ecosystem ensures that data is synchronized in real-time across devices. This capability allows users to access the latest mandi prices, regardless of device or location, making the app highly responsive to dynamic market changes.

6.5 Workflow

1. User Registration

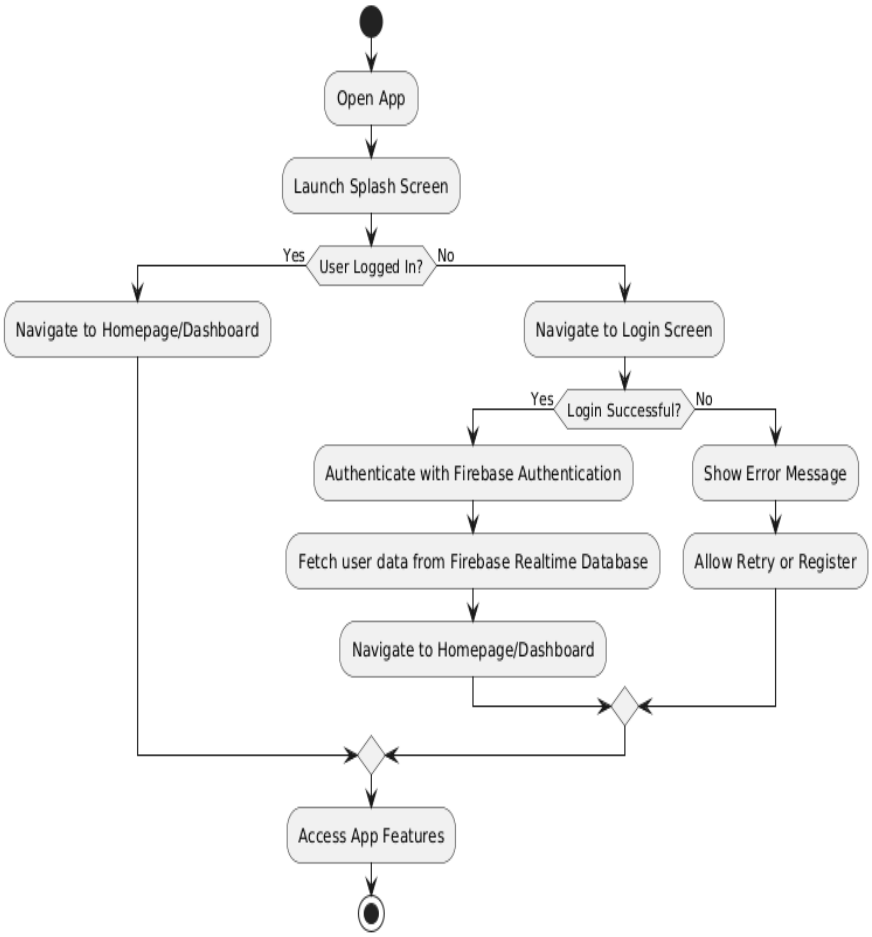


Figure 6.2: User Registration

- **App Launch and Navigation:** On launching app, the user is presented with the splash screen. If the user is not logged in, they are navigated to login/registration screen.
- **Registration Process:** If the user opts to register, they provide their details such as name, email, and password. The app validates the inputs to ensure all required fields are correctly filled and meet the specified format.
- **Authentication:** The registration data is sent to Firebase Authentication for creating a new account. Firebase validates the details and securely stores user credentials.
- **Database Integration:** Upon successful registration, additional user information, if required, is stored in the Firebase Realtime Database. This step ensures that user-specific data is synchronized and retrievable during subsequent app usage.
- **Post-Registration Navigation:** Once the registration is complete, the user is directed to the dashboard, granting access to the app's features. In case of any errors during registration, error messages are displayed, and the user is prompted to retry.

2. Crop Information and Mandi Recommendation

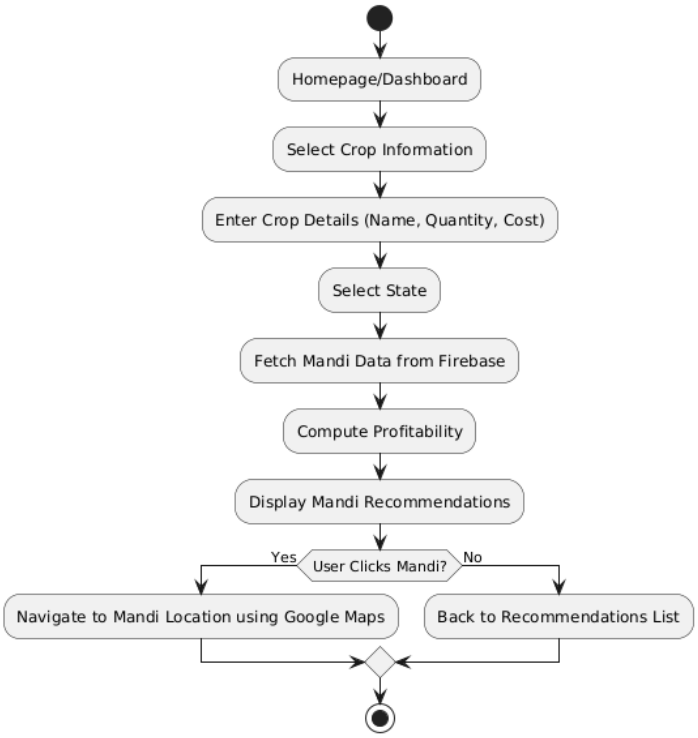


Figure 6.3: Crop Information and Mandi Recommendation

- **Homepage:** The process begins at the homepage/dashboard of the app, where users initiate the workflow.
- **Crop Information Selection:** Users select their desired crop for which they want mandi recommendations.
- **Crop Details Input:** Users enter key details such as crop name, quantity, and cost.
- **State Selection:** The user specifies their state to filter mandi data relevant to their region.
- **Mandi Data Retrieval:** The app fetches mandi-related data from Firebase, ensuring updated and accurate information.
- **Profitability Computation:** The app computes the potential profitability for the selected crop across different mandis.
- **Display Recommendations:** A list of mandi recommendations is displayed, sorted by profitability and other factors.
- **User Decision:** If the user selects a mandi, they are navigated to the mandi location via Google Maps. If they opt not to proceed, they are redirected back to the recommendations list to explore further options.

6.6 Data Collection and Processing

Data collection and processing form the backbone of the *Kisan Buddy* application, ensuring that users receive accurate and actionable insights. The primary data source is the **Open Government Data Platform India**, providing reliable mandi information, including state, district, crop name, mandi prices, and market names. This information is critical for making informed decisions about selling produce.

To adapt the data for mobile application use, it is uploaded into Firebase Realtime Database. Firebase's hierarchical data structure supports rapid retrieval and ensures seamless synchronization across devices. The data undergoes a rigorous preprocessing phase to enhance its quality and usability:

i. **Cleaning and Validation**: Inconsistent, redundant, or incomplete entries are removed or corrected to maintain data integrity.
ii. **Normalization**: The dataset is structured for optimal storage and retrieval in Firebase, including categorizing by state, district, and crop.
iii. **Optimization**: Filters are applied for crop types and price ranges to improve search accuracy and reduce query times.

Data processing includes calculating profitability using the formula: **Profit = (Mandi Price − User Crop Cost) × Quantity.** This computation ensures that the most profitable mandi recommendations are displayed. The processed data is dynamically presented using RecyclerViews, ensuring user-friendly access to real-time insights.

6.7 Firebase Integration

Firebase serves as the central backend infrastructure for *Kisan Buddy*, providing robust services that simplify development and enhance app performance. The **Firebase Realtime Database** ensures that data such as mandi details, crop information, and user preferences are synchronized in real time. The integration is structured as follows:

i. **Firebase Authentication**: Firebase Authentication secures user accounts, enabling registration and login using email and password. It prevents unauthorized access and ensures user data integrity.

ii. **Realtime Database**: The hierarchical nature of Firebase Realtime Database allows for storing structured data, such as mandi recommendations, user details, and recent searches. This enables rapid data retrieval and dynamic updates without requiring explicit refreshes.

iii. **Firestore Database**: Complementary to the Realtime Database, Firestore stores data like registered crops and user input, enabling advanced query handling and scalability for future expansions.

Firebase simplifies the implementation of essential functionalities like user authentication, real-time data updates, and secure data storage, creating a reliable backend for the application.

6.8 Technology Stack

The *Kisan Buddy* application is built using a carefully chosen technology stack to ensure efficiency, scalability, and user engagement. The stack is as follows:

i. **Front-End Technologies**:
   - **Android Studio**: The primary development environment for creating the user interface and implementing application logic.
   - **XML Layouts**: Define UI components adhering to Material Design principles for a visually appealing and user-friendly interface.
   - **Java**: The programming language used for application logic, including user interactions, data handling, and navigation features.

ii. **Backend Technologies**:
   - **Firebase Realtime Database**: Provides a real-time, cloud-hosted NoSQL database for storing mandi data, crop details, and user-specific preferences.
   - **Firebase Authentication**: Ensures secure login and registration processes.
   - **Firestore Database**: Manages additional data, including crop details submitted by users.

iii. **Third-Party Tools**:
   - **Google Maps for Navigation**: Allows users to navigate to selected mandis with turn-by-turn directions.

iv. **Utilities**:

- **Shared Preferences**: Stores local data such as recent recommendations and user-specific preferences.

6.9 Testing and Optimization

Testing and optimization are crucial phases in the development of *Kisan Buddy* to ensure its reliability, usability, and performance. This section focuses on the systematic validation and refinement of the application to meet user expectations and functional requirements.

Testing

1. **Functional Testing and Optimization:**

   Core functionalities, such as user authentication, mandi data retrieval, filtering, sorting, and navigation, were rigorously tested for accurate behavior under normal and edge-case scenarios. Filtering and sorting features were validated with diverse crop names, regions, and price ranges to ensure consistent results. To optimize performance, database queries were indexed, and caching mechanisms were implemented, enabling faster data retrieval with minimal delays.

2. **Integration Testing and Optimization:**

   Integration testing focused on the seamless interaction between the app's components, such as Firebase Authentication, Realtime Database, and Google Maps navigation. Secure login and registration workflows were validated alongside efficient data synchronization. Network requests were optimized to eliminate redundancy, and local caching reduced frequent database queries, ensuring faster responses and lower network usage.

3. **Performance Testing and Optimization:**

   Performance testing aimed to identify bottlenecks, focusing on the app's responsiveness and load times. RecyclerViews were optimized for efficient rendering of large datasets, ensuring smooth scrolling and data updates even for extensive mandi records. The Firebase Realtime Database and Firestore were stress-tested for query response times under high loads.

4. **Usability Testing and UI/UX Optimization:**

   Usability testing involved a sample group of farmers to evaluate the app's user

interface and overall experience. Feedback was collected on navigation clarity, ease of entering crop details, and understanding mandi recommendations. This iterative process refined the app to align with user preferences.

5. **Security Testing and Error Handling Optimization:**

   The app was validated for robust data security. Firebase Authentication prevented unauthorized access, and sensitive user data stored in Firebase Realtime Database and Shared Preferences was secured. Comprehensive error-handling mechanisms provided meaningful feedback to users and prevented crashes. Tools like Logcat were utilized during development to identify and resolve issues effectively.

By integrating rigorous testing with targeted optimizations, Kisan Buddy ensures a seamless, scalable, and user-centric experience. This holistic approach guarantees the app meets functional requirements while maintaining high reliability, efficiency, and usability for Indian farmers.

CHAPTER-7

TIMELINE FOR EXECUTION OF PROJECT

(GANTT CHART)

Figure 7.1: Gantt Chart

Phases of Project Timeline:

Phase 1: Data Collection and UI/UX Design (1st September – 30th September)

In Phase 1, the project team focused on gathering essential data and designing the user interface. From 1st September to 15th September, data collection was completed, which included gathering relevant information on crops, mandi locations, costs, and farmer inputs. This data served as the foundation for the app's functionality. From 16th September to 30th September, the UI/UX design process was carried out, where wireframes, prototypes, and the initial app layout were created, ensuring the design was intuitive and aligned with user needs.

Phase 2: Front-end Development (1st October – 21st October)

In Phase 2, the development of the app's front-end took place from 1st October to 21st October. The first week, from 1st October to 7th October, was dedicated to setting up the development environment, including integrating necessary frameworks and libraries. From 8th October to 14th October, front-end coding was initiated, focusing on user interfaces for crop input, location services, and mandi search functionalities. The final week, from 15th October to 21st October, involved finalizing the front-end screens and conducting internal testing to ensure a smooth and intuitive user experience.

Phase 3: Backend Development (22nd October – 5th December)

Phase 3 focused on backend development and ran from 22nd October to 5th December. The first week, from 22nd October to 31st October, involved setting up the backend architecture, configuring Firebase, and designing the database structure. From 1st November to 15th November, location services were integrated with Firebase and Google Maps APIs, and algorithms for cost estimation and transaction analysis were developed. The final weeks, from 16th November to 5th December, focused on refining the backend, testing database interactions, and ensuring the system was fully functional.

Phase 4: Feature Implementation, Testing, and Optimization (6th December – 20th December)

In Phase 4, feature implementation, testing, and optimization were completed from 6th December to 20th December. The first week, from 6th December to 12th December, was dedicated to implementing the remaining features of the app, including cost calculation and mandi suggestions. From 13th December to 17th December, the front-end and back-end systems were integrated, followed by system-wide testing for functionality, user experience, and cross-platform compatibility. The final few days, from 18th December to 20th December, were focused on optimization, performance improvements, and final bug fixing to ensure the app was ready for deployment.

CHAPTER-8
OUTCOMES

The Kisan Buddy project is a robust and comprehensive platform designed to address the challenges faced by Indian farmers in selling their crops. The application combines advanced technology, user-friendly design, and real-time data to provide meaningful solutions. The outcomes of this project are directly aligned with its objectives and demonstrate its impact on empowering farmers through accessible and reliable tools.

8.1 Real-Time Access to Mandi Price Information

One of the core achievements of Kisan Buddy is the provision of real-time mandi price information. Leveraging Firebase Firestore, the app retrieves and displays accurate, up-to-date crop price data from various mandis across India. This eliminates farmers' reliance on word-of-mouth or outdated sources and ensures they have access to reliable data for making informed decisions. The system ensures quick updates and easy accessibility, even in rural areas with limited internet connectivity.

8.2 Data-Driven Decision-Making

Kisan Buddy provides analytical insights that empower farmers to make data-driven decisions. By taking user inputs such as crop type, quantity, and cost, the app identifies the most profitable mandis. The backend algorithms process this data in real time, ensuring farmers receive recommendations that are accurate and tailored to their needs. This feature reduces guesswork, mitigates risks, and maximizes profitability.

8.3 Improved Profitability for Farmers

The application empowers farmers by providing tools to compute potential profits based on mandi prices, crop costs, and quantity. This profitability analysis helps farmers identify the most lucrative mandis for selling their produce, ensuring they maximize their earnings. By offering a clear comparison of options, *Kisan Buddy* reduces guesswork and fosters data-driven decision-making, directly improving farmers' financial outcomes.

8.4 Seamless Navigation to Mandis

The integration of Google Maps enables farmers to navigate efficiently to selected mandis. This feature addresses logistical challenges, especially for farmers visiting unfamiliar locations. With real-time, turn-by-turn directions, the app ensures that transportation is efficient, cost-effective, and error-free. This reduces time spent on travel and minimizes associated costs, enhancing overall operational efficiency.

8.5 Dynamic Filtering and Sorting

To cater to diverse user needs, the app incorporates dynamic filtering and sorting functionalities. Farmers can filter mandi data based on parameters such as crop type, state, or district. Sorting options prioritize the most profitable or nearest mandis. These features streamline the decision-making process, ensuring that farmers can quickly find the information most relevant to their needs.

8.6 Mandi Recommendation Engine

The app's recommendation engine is a standout feature, designed to suggest mandis based on profitability. By analysing mandi price data and user inputs, the app ranks markets to provide farmers with actionable recommendations. This ensures farmers can prioritize mandis offering the highest returns, significantly improving their financial outcomes.

8.7 Historical Data Tracking

Kisan Buddy stores and maintains a history of mandi searches and recommendations using Firebase Realtime Database and SharedPreferences. This feature provides users with a record of their past interactions with the app, including visited mandis, profits earned, and market trends. Farmers can analyze this historical data to identify patterns, track price fluctuations, and refine their decision-making processes over time.

8.8 Farmer-Friendly User Interface

The user interface of *Kisan Buddy* is designed specifically for farmers, ensuring accessibility even for those with minimal technical expertise. *Kisan Buddy* enhances digital literacy among farmers by providing a user-friendly mobile application tailored for their needs. The layout is simple yet effective, with clear navigation, responsive buttons, and informative prompts. The app ensures that every feature, from filtering to navigation, is easy to understand and execute,

enhancing its usability for rural audiences. The app's intuitive interface, designed specifically for ease of use, along with clear guidance on its features, empowers farmers to embrace technology in their agricultural practices. This approach not only fosters confidence in using digital tools but also has long-term benefits for bridging the digital divide in farming communities.

8.9 Secure Authentication

The implementation of Firebase Authentication ensures secure user login and registration. Farmers can create accounts and log in using their email and password, with sensitive data securely managed in Firebase Realtime Database. This ensures that only authorized users can access the app while maintaining user privacy and data integrity.

8.10 Scalable and Robust Technology Framework

The project utilizes modern technologies such as Firebase Firestore, Firebase Realtime Database, and Android Studio to ensure scalability and reliability. The architecture is designed to handle real-time data synchronization while supporting potential future enhancements. For instance, the app can be extended to support additional crops, regions, or features like multilingual support.

CHAPTER-9
RESULTS AND DISCUSSIONS

Results:

1. Real-Time Access to Mandi Price Data

Kisan Buddy provides farmers with up-to-date mandi price information, sourced from the Firebase Realtime Database. By ensuring access to current mandi prices for various crops across states, the app eliminates reliance on middlemen and outdated data. This transparency empowers farmers to make informed decisions, boosting their market competitiveness.

2. Empowering Farmers Through Profitability Computation and Mandi Recommendation

The profitability computation feature was successfully implemented to guide farmers in identifying the most profitable mandis. By comparing mandi prices with user-inputted crop costs and quantities, the app provides actionable insights to maximize earnings. The calculation process, based on a clear formula, simplifies financial analysis for farmers. This feature addresses a critical gap in decision-making and has the potential to significantly impact farmers' financial stability. Future updates can include visual analytics to make profit comparisons even more intuitive.

Figure 9.1: Result

3. Simplified Navigation to Mandis

The integration of Google Maps allows farmers to locate and navigate to nearby mandis effortlessly. By selecting a mandi from the app, users can view its exact location and receive step-by-step directions. This feature minimizes logistical challenges, reduces transportation costs, and saves time. Farmers in rural areas with limited knowledge of mandi locations benefit greatly from this addition. Expanding the feature to include route optimization for multiple mandis could further enhance its utility.

4. Dynamic Filtering, Sorting, and History

The app's filtering and sorting capabilities enable farmers to customize mandi searches based on state, district, and crop preferences. Sorting options, such as profit and price, prioritize the most relevant results, streamlining the decision-making process. Additionally, the history feature allows users to revisit previous searches and decisions, providing continuity and convenience. Farmers appreciate this functionality, especially in areas with intermittent internet connectivity, as it supports offline access. Future enhancements could involve integrating advanced filters like mandi proximity and seasonal trends.

5. User-Centric Design and Adoption Potential

The farmer-centric design of *Kisan Buddy* ensures ease of use for individuals with varying levels of digital literacy. Material Design principles, intuitive navigation, and visual aids contribute to an engaging user experience. Initial feedback indicates high user satisfaction with the app's layout and functionality. This focus on usability positions the app as an effective tool for bridging the digital divide in rural areas.

Discussions

The results of the Kisan Buddy project highlight its potential to revolutionize how farmers interact with market data. By leveraging technology, the app bridges critical gaps in accessing real-time information and making informed decisions. The integration of Firebase technologies for data management ensures reliability, while the use of Google Maps addresses logistical challenges, enabling efficient transportation.

However, certain limitations were identified during the implementation and testing phases. For instance, the app currently supports only English, which may restrict accessibility for non-

English-speaking farmers. Additionally, its reliance on internet connectivity for accessing Firebase data may pose challenges in rural areas with limited network infrastructure. Addressing these limitations in future iterations will enhance the app's inclusivity and effectiveness.

The project's success demonstrates the feasibility of deploying technology-driven solutions in the agricultural sector. The results underline the importance of real-time data, user-centric design, and secure systems in empowering farmers. Moving forward, the integration of advanced features such as predictive analytics and multilingual support can further extend the app's utility and impact.

CHAPTER-10
CONCLUSION

The *Kisan Buddy* project represents a significant step forward in leveraging technology to address critical challenges faced by Indian farmers. By providing real-time mandi price data, profitability computations, and seamless navigation services, the app empowers farmers to make informed decisions, enhance their productivity, and maximize their earnings. The integration of Firebase for secure data management, Google Maps for navigation, and a farmer-centric user interface ensures that the platform is accessible, reliable, and scalable. This project not only bridges the information gap between farmers and markets but also contributes to reducing inequalities and fostering economic growth in rural communities. By offering features such as historical data tracking, dynamic filtering, and personalized recommendations, *Kisan Buddy* enhances user engagement and builds trust among its stakeholders. The success of this project underscores the potential of innovative, technology-driven solutions in the agricultural sector. It serves as a model for future endeavours aimed at empowering underserved communities through data-driven approaches. While the current system offers robust functionalities, it also lays a strong foundation for further enhancements, ensuring long-term impact and sustainability.

Future Scope

1. **Multilingual Support**: Incorporating additional regional languages will enhance inclusivity and broaden the app's adoption among farmers from various linguistic backgrounds.
2. **Advanced Analytics**: Providing predictive analytics for crop trends and price forecasts.
3. **IoT Integration**: Utilizing IoT devices to monitor crop health and optimize yield.
4. **Additional Features**: Integration of advanced tools such as weather forecasts, pest management recommendations, and access to government agricultural schemes.
5. **Geographical Expansion:** Increasing coverage of mandis and crops to serve a larger agricultural community.

REFERENCES

[1] *Agarwalla, A. (2015). Independent work report: Kisan Network (Hindi for "Farmer Network"). Princeton University, Department of Computer Science. Retrieved from https://www.cs.princeton.edu/~rdondero/iw/15Agarwalla.pdf*

[2] *Haseemun, P., & Somasekhar, K. (2019). A study of Farmers Buddy app development. International Journal of Computer Sciences and Engineering, 7(Special Issue 6), 173–175. https://doi.org/10.26438/ijcse/v7si6.173175*

[3] *Kambale, P., Dharma Raj, B. M., Patil, D., & Ganavi, N. R. (2024). Mobile technology for farmers: An overview of agricultural apps. Asian Journal of Agricultural Extension, Economics & Sociology, 42(9), 75–81. https://doi.org/10.9734/ajaees/2024/v42i92543*

[4] *Khawas, C., & Shah, P. (2018). Application of Firebase in Android app development: A study. International Journal of Computer Applications. https://doi.org/10.5120/ijca2018917200*

[5] *Kumari, D. (2022). A study of agriculture-related mobile apps and its impact on farming system. DDU Gorakhpur University. IJCRT, 10(2). https://ijcrt.org/papers/IJCRT2202239.pdf*

[6] *Mohan, C. R., Kumar, C. S., Chowdary, K. L. N., Ganesh, K. V. S., & Narahari, C. V. (2024). Farmers Buddy: Farmers Online Selling Application. International Journal of Research in Engineering, IT and Social Sciences, 14(06), 29–37. Retrieved from https://www.indusedu.org/pdfs/IJREISS/IJREISS_4234_61801.pdf*

[7] *Nimje, M., & Wankhede, P. (2019). Farmer Buddy. In R. Babu (Ed.), National Conference on "Recent Advances in Engineering and Technology" (SAMMANTRANA 19) (Vol. 4, No. 8). International Journal of Innovations in Engineering and Science. Retrieved from https://www.ijies.net/finial-docs/finial-pdf/220519CS10.pdf*

[8] *Oteyo, I.N., Marra, M., Kimani, S. et al. A Survey on Mobile Applications for Smart Agriculture. SN COMPUT. SCI. 2, 293 (2021). https://doi.org/10.1007/s42979-021-00700-x*

[9] *Prof., Gorde, Vaishali, S.., Bidgar, Gaurav, D.., Pangavhane, Kalyani, K.., Shinde, Pranali, S.., Jeughale, Ashish, M.. (2024). Farmer Application. International Journal of Advanced Research in Science, Communication and Technology, doi: 10.48175/ijarsct-17280*

[10] *Saraf, P. R., Jadhao, S. M., Wanjari, S. J., Kolwate, S. G., & Patil, A. D. (2022). A review on Firebase (Backend as a Service) for mobile application development. International Journal for Research in Applied Science & Engineering Technology (IJRASET, 10(1), 967–973. Retrieved from https://www.ijraset.com/best-journal/firebase-backend-as-a-service-for-mobile-application-development*

APPENDIX-A

PSUEDOCODE

1. Splash Screen

```
Uri video=Uri.parse("android.resource://"+getPackageName()+"/"+R.raw.kisan_splash);
   videoView.setVideoURI(video);
   videoView.setOnCompletionListener(new MediaPlayer.OnCompletionListener() {
      @Override
      public void onCompletion(MediaPlayer mediaPlayer) {
         if(isFinishing())
            return;
         startActivity(new Intent(SplashActivity.this,MainActivity.class));
         finish();
      }
   });
   videoView.start();
}
```

2. User Registration

```
mAuth.createUserWithEmailAndPassword(email, password)
         .addOnCompleteListener(this, task -> {
            if (task.isSuccessful()) {
               Toast.makeText(this, "SignIn successful", Toast.LENGTH_SHORT).show();
               String userId = task.getResult().getUser().getUid();
               saveUserData(userId, name, number, email, address, city, password);
               Intent intent = new Intent(RegisterActivity.this, MainActivity.class);
               intent.addFlags(Intent.FLAG_ACTIVITY_CLEAR_TOP |
Intent.FLAG_ACTIVITY_NEW_TASK);
               startActivity(intent);
               finish();
            } else {
               if (task.getException() instanceof FirebaseAuthUserCollisionException) {
                  Toast.makeText(RegisterActivity.this, "This email is already registered",
Toast.LENGTH_LONG).show();
```

```
            } else {
                Toast.makeText(RegisterActivity.this, "Registration failed: " +
task.getException().getMessage(), Toast.LENGTH_LONG).show();
            }
        }
    });
}
private void saveUserData(String userId, String name, String number, String email, String
address, String city, String password) {
   DatabaseReference database = FirebaseDatabase.getInstance().getReference("users");
   User user = new User(name, number, email, address, city, password);
   database.child(userId).setValue(user);
}
```

3. User Login

```
mAuth.signInWithEmailAndPassword(email, password)
    .addOnCompleteListener(this, task -> {
      if (task.isSuccessful()) {
        Toast.makeText(LoginActivity.this, "Login successful!",
Toast.LENGTH_SHORT).show();
        startActivity(new Intent(this, MainActivity.class));
        finish();
      } else {
        Toast.makeText(LoginActivity.this, "Login failed: " +
task.getException().getMessage(), Toast.LENGTH_LONG).show();
      }
    });
```

4. Navigation Buttons

```
ivProfile.setOnClickListener(v -> startActivity(new Intent(MainActivity.this,
ProfileActivity.class)));
ivBudget.setOnClickListener(v -> startActivity(new Intent(MainActivity.this,
BudgetActivity.class)));
ivHistory.setOnClickListener(v -> startActivity(new Intent(MainActivity.this,
HistoryActivity.class)));
```

5. Fetching and Displaying Mandi Data from Firestore

```
db.collection("MandisData")
      .get()
      .addOnCompleteListener(task -> {
         if (task.isSuccessful()) {
            List<Mandi> mandiList = new ArrayList<>();
            for (QueryDocumentSnapshot document : task.getResult()) {
               String fetchedState = document.getString("State");
               String fetchedCropName = document.getString("CropName");
               // Check if the fetched crop name contains the desired crop name
               if (fetchedCropName != null &&
fetchedCropName.toLowerCase().contains(cropName.toLowerCase().trim())) {
                  String district = document.getString("District");
                  String market = document.getString("Market");
                  double price = document.getDouble("Price");
                  double profitPerUnit = price - userCropCost;
                  mandiList.add(new Mandi(fetchedState, district, market, fetchedCropName,
price, profitPerUnit * cropQuantity));
               }
            }
            // Process data
            processMandiList(mandiList, state);
         } else {
            Log.e("MandisActivity", "Error getting documents: ", task.getException());
            Toast.makeText(MandisActivity.this, "Error fetching data",
Toast.LENGTH_SHORT).show();
         }
      });
```

6. Profitability Computation for Mandi Recommendations

```
Collections.sort(stateMandis, (m1, m2) -> Double.compare(m2.getProfit(), m1.getProfit()));
Collections.sort(otherStateMandis, (m1, m2) -> Double.compare(m2.getProfit(),
m1.getProfit()));
// Combine lists, giving priority to state-matching mandis
```

```
List<Mandi> combinedMandis = new ArrayList<>();
combinedMandis.addAll(stateMandis);
combinedMandis.addAll(otherStateMandis);
```

7. Navigation to Selected Mandi using Google Maps

```
holder.itemView.setOnClickListener(v -> {
        String query = mandi.getName() + ", " + mandi.getDistrict() + ", " + mandi.getState();
        Uri gmmIntentUri = Uri.parse("geo:0,0?q=" + Uri.encode(query));
        Intent mapIntent = new Intent(Intent.ACTION_VIEW, gmmIntentUri);
        mapIntent.setPackage("com.google.android.apps.maps");
        // Attempt to launch Google Maps
        context.startActivity(mapIntent);
```

8. Maintaining Search History using SharedPreferences

```
private void saveFirstMandiToHistory(Mandi mandi) {
    SharedPreferences sharedPreferences = getSharedPreferences("mandi_history",
MODE_PRIVATE);
    SharedPreferences.Editor editor = sharedPreferences.edit();
    Gson gson = new Gson();
    String json = sharedPreferences.getString("history", null);
    Type listType = new TypeToken<List<Mandi>>() {}.getType();
    List<Mandi> mandiHistory = json != null ? gson.fromJson(json, listType) : new
ArrayList<>();
    // Add the new mandi at the top
    mandiHistory.add(0, mandi);
    // Ensure history size does not exceed 5
    if (mandiHistory.size() > 5) {
        mandiHistory.remove(mandiHistory.size() - 1);
    }
    String updatedJson = gson.toJson(mandiHistory);
    editor.putString("history", updatedJson);
    editor.apply();
 }
```

APPENDIX-B

SCREENSHOTS

1. Mobile App Interface

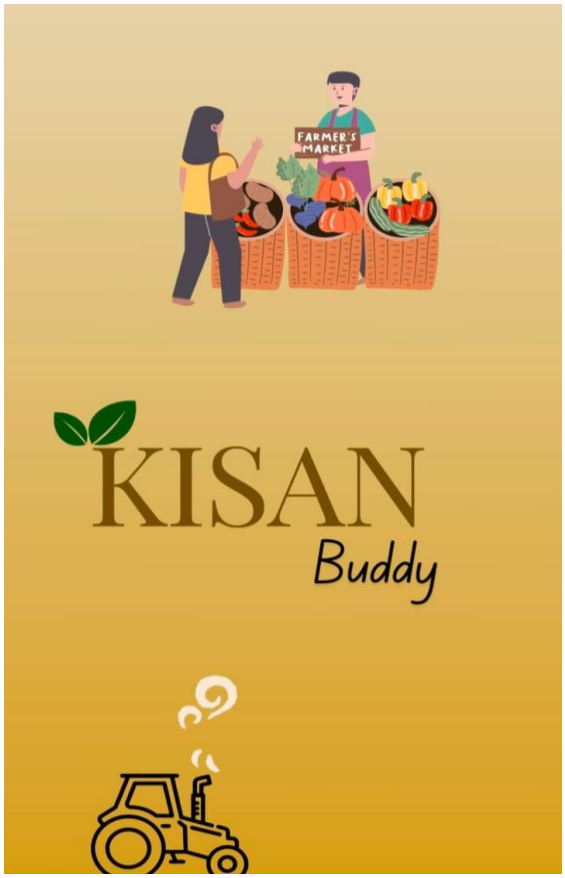


Figure B.1: Splash Screen

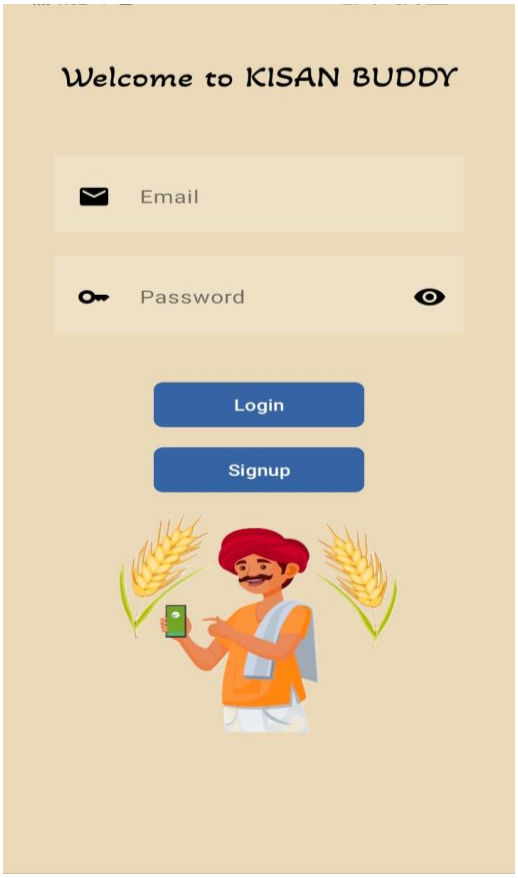


Figure B.2: Login Page

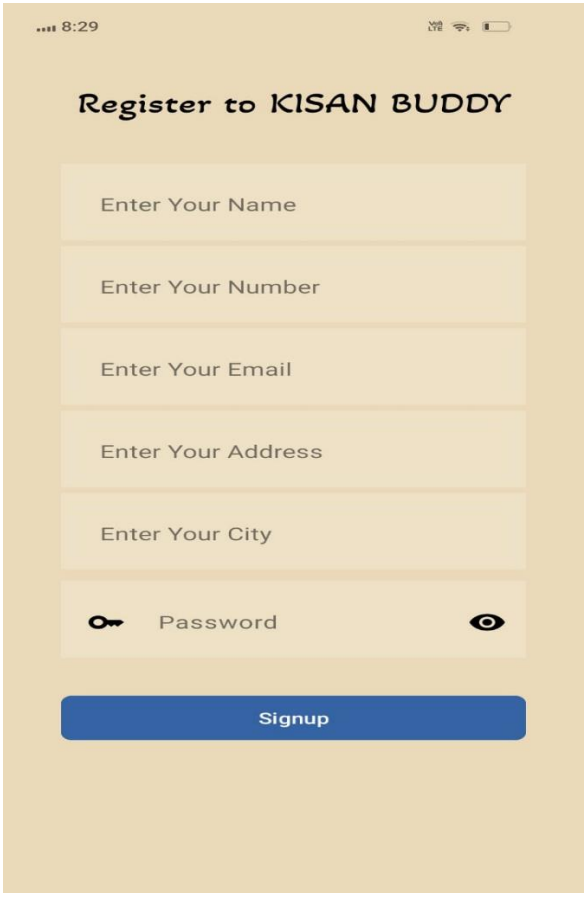


Figure B.3: Signup Page

Figure B.4: Dashboard

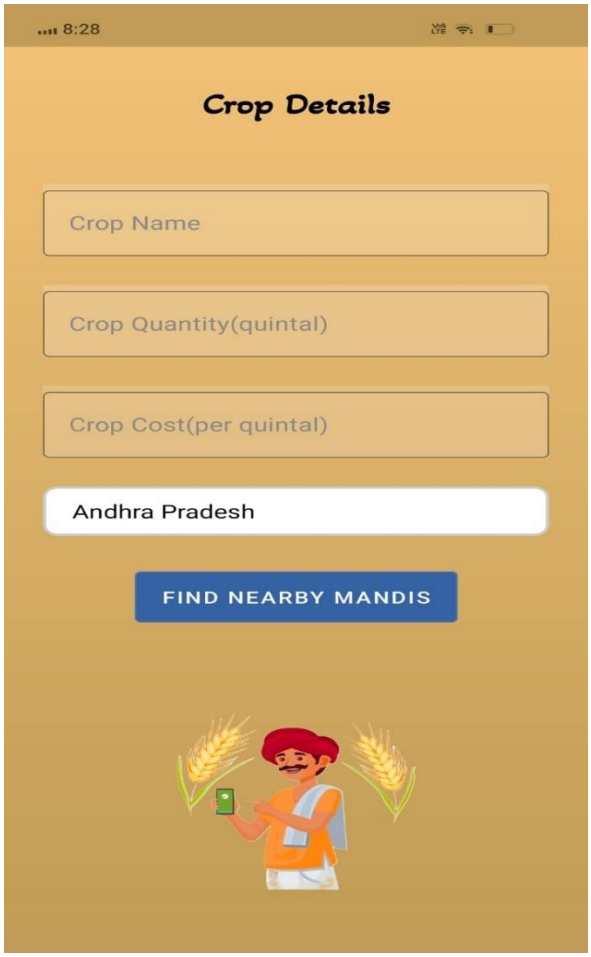


Figure B.5: Crop Details

Figure B.6: Nearby Mandis

Figure B.7: Recent Recommended Mandis

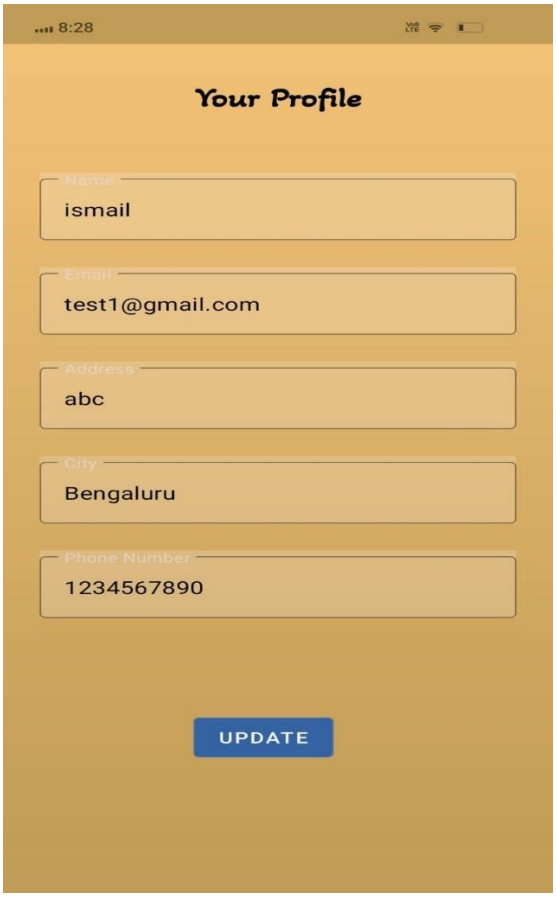


Figure B.8: Profile

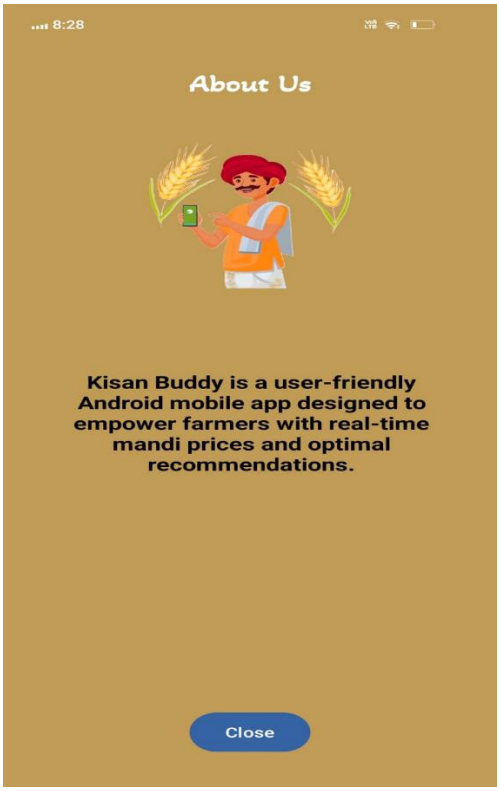


Figure B.9: About Us

2. Firebase

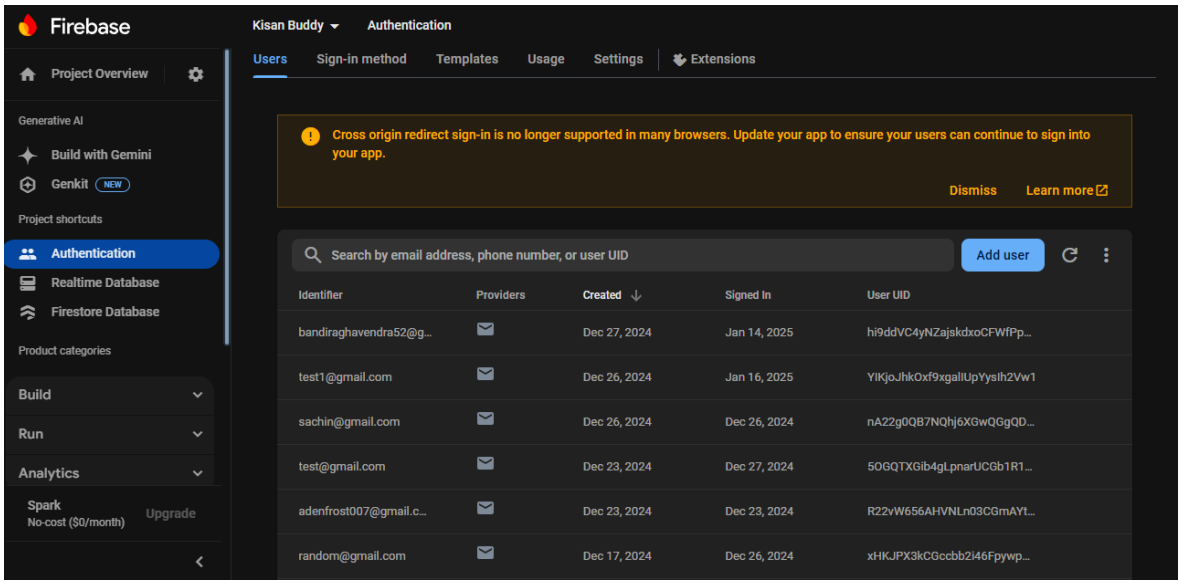


Figure B.10: Firebase Authentication (Email/password)

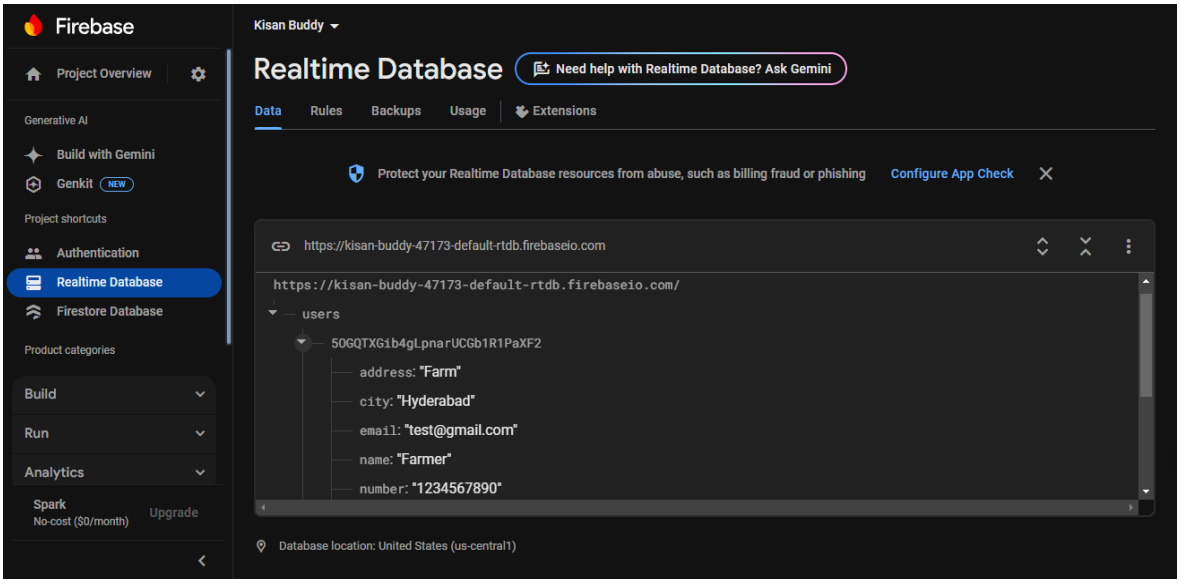


Figure B.11: Firebase Realtime Database

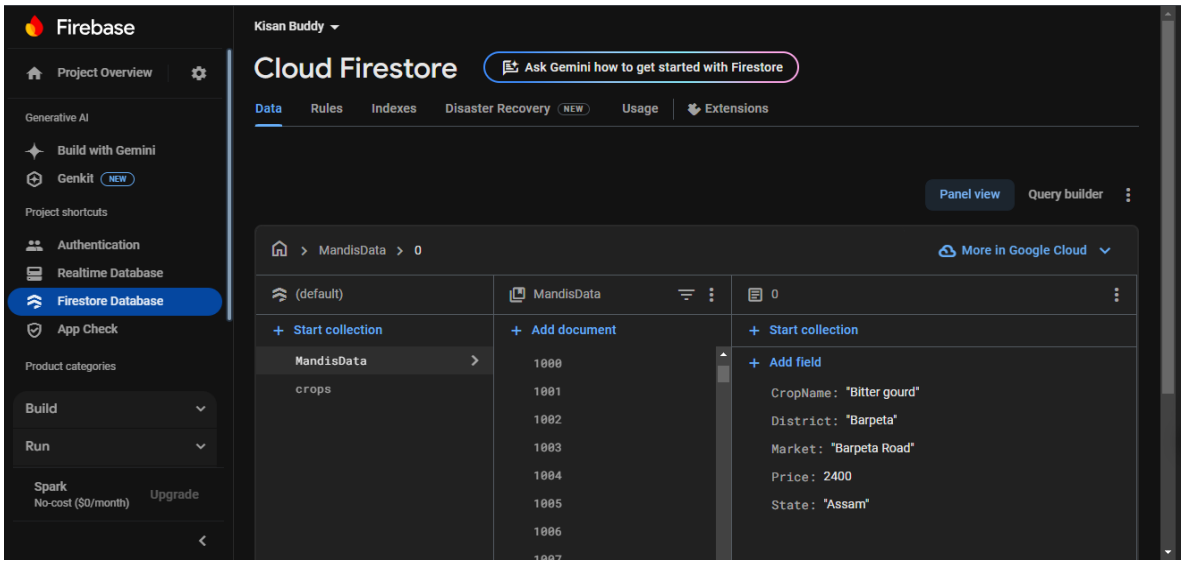


Figure B.12: Firestore

APPENDIX-C

ENCLOSURES

1. Similarity Index / Plagiarism Check report

KISAN BUDDY

ORIGINALITY REPORT

14%	9%	5%	11%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Symbiosis International University Student Paper	5%
2	Submitted to Presidency University Student Paper	2%
3	Submitted to University of West London Student Paper	1%
4	Submitted to University of Greenwich Student Paper	<1%
5	fastercapital.com Internet Source	<1%
6	"Intelligent Robots and Drones for Precision Agriculture", Springer Science and Business Media LLC, 2024 Publication	<1%
7	Submitted to Chester College of Higher Education Student Paper	<1%
8	Submitted to M S Ramaiah University of Applied Sciences	<1%

	Student Paper	
9	mpilofoundation.com Internet Source	<1 %
10	Submitted to City University Student Paper	<1 %
11	www.java2s.com Internet Source	<1 %
12	Submitted to Central Queensland University Student Paper	<1 %
13	Submitted to Nanyang Technological University, Singapore Student Paper	<1 %
14	Submitted to Nottingham Trent University Student Paper	<1 %
15	wasmeinfo.org Internet Source	<1 %
16	Mahesh Chand, Vineet Jain, Puneeta Ajmera. "Data-Driven Technologies and Artificial Intelligence in Supply Chain - Tools and Techniques", CRC Press, 2023 Publication	<1 %
17	Submitted to Yeditepe University Student Paper	<1 %
18	1library.net Internet Source	<1 %

19	Ch. Vandana, R. Anirudh Reddy, M. Yashaswini, K. Ashritha, K. Harika, M. Sai Kalyan Yadav. "Smart Wearable Device for Safety Monitoring using IoT", 2023 International Conference on Sustainable Computing and Smart Systems (ICSCSS), 2023 Publication	<1 %
20	Ewa Wanda Ziemba, Cong Doanh Duong, Joanna Ejdys, Maria Alejandra Gonzalez-Perez et al. "Leveraging artificial intelligence to meet the sustainable development goals", Journal of Economics and Management, 2024 Publication	<1 %
21	datahorizzonresearch.com Internet Source	<1 %
22	Submitted to The University of the West of Scotland Student Paper	<1 %
23	aimrj.com Internet Source	<1 %
24	iwaponline.com Internet Source	<1 %
25	V. Sharmila, S. Kannadhasan, A. Rajiv Kannan, P. Sivakumar, V. Vennila. "Challenges in Information, Communication and Computing Technology", CRC Press, 2024 Publication	<1 %

26	www.coursehero.com Internet Source	<1 %
27	Amir Shachar. "Introduction to Algogens", Open Science Framework, 2024 Publication	<1 %
28	Submitted to Indian School of Business Student Paper	<1 %
29	sites.google.com Internet Source	<1 %
30	www.peterlang.com Internet Source	<1 %
31	Submitted to Colorado State University, Global Campus Student Paper	<1 %
32	www.ijrdet.com Internet Source	<1 %
33	Submitted to Multimedia University Student Paper	<1 %
34	housingprototypes.org Internet Source	<1 %
35	pestleanalysis.com Internet Source	<1 %
36	Submitted to Singapore Institute of Technology Student Paper	<1 %

37	Submitted to University of North Texas Student Paper	<1%
38	Parul Dubey, Gurpreet Singh Chhabra, Bui Thanh Hung, Umashankar Ghugar. "Developing AI, IoT and Cloud Computing-based Tools and Applications for Women's Safety", CRC Press, 2024 Publication	<1%
39	ageconsearch.umn.edu Internet Source	<1%
40	codinginflow.com Internet Source	<1%
41	hi.knoema.com Internet Source	<1%
42	Dinesh Goyal, Bhanu Pratap, Sandeep Gupta, Saurabh Raj, Rekha Rani Agrawal, Indra Kishor. "Recent Advances in Sciences, Engineering, Information Technology & Management - Proceedings of the 6th International Conference “Convergence2024” Recent Advances in Sciences, Engineering, Information Technology & Management, April 24–25, 2024, Jaipur, India", CRC Press, 2025 Publication	<1%
43	M. Pradeep, Amit Kumar Tyagi. "chapter 9 Smart Sensor-Based Smart Agriculture for	<1%

	Better Crop Production in This Smart Era", IGI Global, 2024 Publication	
44	rightsandequalitysandwell.co.uk Internet Source	<1%
45	unhabitat.org Internet Source	<1%
46	Muhammad Waseem Bari, Francesca Di Virgilio. "Handbook of Talent Management and Learning Organizations - A Post-Pandemic Perspective", CRC Press, 2025 Publication	<1%
47	Submitted to Study Group Worldwide Student Paper	<1%
48	link.springer.com Internet Source	<1%
49	repository.nwu.ac.za Internet Source	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		

2. Research paper

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 09 ISSUE: 01 | JAN - 2025 SJIF RATING: 8.448 ISSN: 2582-3930

KISAN BUDDY

Dr. Vairavel Chenniyappan
School of Computer Science and Engineering
Presidency University
Bengaluru, India
vairavel.c@presidencyuniversity.in

Mohammed Ismail
School of Computer Science and Engineering
Presidency University
Bengaluru, India
mohammed.20211cse0784@presidencyuniversity.in

Shaik Akram
School of Computer Science and Engineering
Presidency University
Bengaluru, India
shaik.20211cse0783@presidencyuniversity.in

Bandi Raghavendra
School of Computer Science and Engineering
Presidency University
Bengaluru, India
bandi.20211cse0762@presidencyuniversity.in

Abstract

The *Kisan Buddy* project is a mobile application designed to empower Indian farmers by addressing critical challenges such as limited market access, outdated market prices, and inefficient trade systems. With agriculture being the backbone of India's economy, improving farmers' accessibility to real-time data and optimized trade mechanisms is essential for sustainable growth. Despite existing applications, research highlights significant gaps, including a lack of real-time market updates, user-friendly interfaces, and robust decision-making support. *Kisan Buddy* bridges these gaps by leveraging Firebase Authentication for secure login and registration, Firebase Realtime Database for seamless data management, and Firestore for structured, scalable data storage. The app offers features like real-time mandi price updates, personalized cost estimation, and intuitive navigation to nearby mandis through Google Maps integration. Methodologically, the application integrates advanced mobile technologies, ensuring offline functionality to cater to the diverse needs of Indian farmers. Early testing has demonstrated improved decision-making, market transparency, and accessibility, fostering better economic outcomes. By addressing issues such as market inefficiencies and digital literacy barriers, the app aligns with the United Nations' Sustainable Development Goals, particularly those related to economic growth and reduced inequalities. *Kisan Buddy* represents a transformative solution, combining innovative technology with user-centric design to enhance agricultural productivity and profitability. This research underscores the potential of digital tools in revolutionizing rural livelihoods, offering a scalable and adaptable framework for improving the socio-economic conditions of farmers in India. The findings highlight its ability to bridge existing gaps and its role in advancing sustainable agricultural practices.

Keywords— Android Application Development, Firebase Authentication, Firebase Realtime Database, Firestore Integration, Mandi Recommendations, Google Maps Navigation

I. INTRODUCTION

The agricultural sector in India forms the backbone of its economy, yet farmers face persistent challenges such as limited market access, lack of real-time information, and inefficient trade practices. The *Kisan Buddy* project aims to address

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 09 ISSUE: 01 | JAN - 2025 SJIF RATING: 8.448 ISSN: 2582-3930

these issues by leveraging modern technologies to empower farmers with digital solutions. This mobile application integrates Firebase Authentication, Firebase Realtime Database, and Firestore to provide a secure, scalable, and efficient backend. It offers features such as real-time access to mandi-related data, geolocation-based navigation for nearby market identification, and financial recommendations to optimize transactions. Designed with a user-friendly interface in Android Studio, *Kisan Buddy* ensures accessibility for farmers, particularly those with minimal technological literacy. By addressing critical gaps such as the absence of real-time market data and the lack of personalized cost estimations, this project bridges the divide between farmers and digital agriculture. Ultimately, *Kisan Buddy* contributes to the economic empowerment of farmers, enhances decision-making, and promotes sustainable agricultural practices, aligning with global efforts to achieve food security and economic growth.

II. LITERATURE REVIEW

The Kisan Buddy project addresses the pressing challenges faced by farmers, including limited market access, lack of real-time information, and inefficient trade systems, by leveraging advancements in mobile technology. Studies have highlighted the transformative potential of digital platforms in empowering farmers. Agarwalla (2015) explored the Kisan Network, which connects farmers directly to buyers, eliminating intermediaries, fostering trust, and improving market efficiency. Similarly, Mohan et al. (2024) demonstrated the impact of features like buyer-seller communication, real-time pricing updates, and transportation sharing on enhancing profitability and optimizing market access. These findings emphasize the importance of integrating transparency and efficiency into platforms like Kisan Buddy to address these challenges effectively.

Mobile technology has emerged as a cornerstone in modern agriculture, enabling features such as real-time price tracking, weather forecasting, and crop advisory services, as noted by Kambale et al. (2024). Their research highlights the necessity of designing user-centric applications for rural populations with limited technological exposure. Complementing this, Nimje and Wankhede (2019) analysed the Farmer Buddy app, which bridges the gap between farmers and markets, offering timely pricing updates and facilitating financial inclusion through digital payment systems. These insights underscore the relevance of incorporating similar features into Kisan Buddy to improve decision-making, enhance productivity, and promote economic resilience.

Emerging technologies like Artificial Intelligence (AI), the Internet of Things (IoT), and machine learning have revolutionized smart agriculture by enabling predictive analytics and precision farming. Oteyo et al. (2021) demonstrated how IoT sensors and AI-driven models optimize resource use and improve productivity through real-time monitoring of soil conditions and weather patterns. Integrating such advanced technologies into Kisan Buddy can significantly enhance its functionality, providing predictive analytics and AI-driven crop advisories to empower farmers in making proactive decisions.

Firebase has proven to be an indispensable tool for mobile application development, offering real-time database management, user authentication, and cloud storage capabilities, as noted by Khawas and Shah (2018) and Saraf et al. (2022). Its offline capabilities and cross-platform compatibility are particularly suited for rural areas with inconsistent internet connectivity. These features make Firebase an ideal choice for Kisan Buddy, ensuring scalability, security, and efficiency in managing critical data like mandi prices, user profiles, and transaction records.

Mobile applications have had a profound impact on farming systems by improving decision-making,

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 09 ISSUE: 01 | JAN - 2025 SJIF RATING: 8.448 ISSN: 2582-3930

market access, and financial inclusion. Kumari (2022) and Gorde et al. (2024) emphasized the importance of value-added services, such as insurance and subsidies, as well as multilingual support and intuitive interfaces, in addressing the diverse needs of farmers. These findings reinforce the need for our project Kisan Buddy to serve as a comprehensive platform, incorporating features that extend beyond basic functionalities to support inclusivity and accessibility, ultimately promoting the economic empowerment of farmers.

III. OBJECTIVES

A. *Enhanced Access to Real-Time Mandi Prices*

Farmers can now access real-time mandi price information for various crops through an intuitive interface. This empowers them to make informed decisions based on up-to-date market data sourced from reliable government platforms and dynamically updated in Firebase databases.

B. *Profitabilty Computation and Recommendations*

The project provides a unique feature that calculates mandi profitability based on user inputs like crop cost and quantity. The app generates a ranked list of mandis, prioritizing those offering maximum profit. The app's core functionality lies in its ability to recommend the most profitable mandis based on real-time price analysis and user inputs. This functionality equips farmers with actionable insights to maximize their earnings.

C. *Seamless Integration of Navigation Services*

By incorporating Google Maps for navigation, the app simplifies the process of locating and traveling to recommended mandis. Farmers can seamlessly switch from evaluating mandi options to receiving precise directions, reducing logistical barriers.

D. *Maintain Historical Data for User Reference*

Kisan Buddy includes functionality to maintain and display a history of mandis visited by the user. This historical data provides valuable insights, enabling farmers to track price trends, compare past profits, and make better-informed decisions.

E. *Farmer-Centric User Interface*

The app's user interface is specifically designed with farmers in mind. Recognizing that many users may have minimal technical expertise, the app incorporates a simple and intuitive layout. Features such as clear instructions, responsive design, and intuitive navigation ensure accessibility for users of all backgrounds.

F. *Ensure Data Security and User Privacy*

Data security and privacy are paramount in Kisan Buddy. Firebase Authentication ensures that only authorized users can access their profiles, while Firebase Firestore encrypts all stored data. The app complies with industry standards for data protection, safeguarding sensitive user information such as personal details and crop data.

IV. METHODOLOGY

The methodology for the Kisan Buddy project is designed to address the challenges faced by Indian farmers in accessing real-time mandi information and making informed decisions. The approach includes systematic planning, implementation of modern technologies, and user-centric design to deliver an efficient, scalable, and user-friendly solution. Below are the key components of the methodology:

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 09 ISSUE: 01 | JAN - 2025 SJIF RATING: 8.448 ISSN: 2582-3930

A. Research Design

The research methodology follows an applied research approach aimed at solving practical problems faced by farmers. The study involves qualitative insights gathered through farmer interviews and quantitative analysis of mandi data to develop a comprehensive mobile application. A user-centered design process ensures that the app aligns with the specific needs of farmers.

B. Data Collection

The mandi price data was sourced from the Open Government Data (OGD) Platform India, which provides accurate and verified information on daily crop prices across multiple markets in India. The dataset contains fields such as state, district, market, crop name, and price. This data was cleaned, validated, and uploaded to Firebase Realtime Database and Firestore for seamless integration with the application.

C. Data Analysis and Processing

The raw dataset underwent preprocessing, including the removal of duplicates and validation of key fields like price and market name. This ensures that the data presented to users is reliable and actionable. Filtering and sorting algorithms allow users to view mandis based on location, crop, and profitability.

D. System Architecture

The application employs a **Model-View-Controller (MVC)** architecture for modular development.

- **Model:** Manages data from Firebase, including mandi information, user profiles, and historical search data.
- **View:** Implements XML layouts for an intuitive user interface, focusing on accessibility for non-technical users.
- **Controller:** Facilitates interaction between the user and data, including data fetching, recommendations, and navigation.

E. Core Functionalities

- **Mandi Recommendations:**
  Profitability computation is a core feature, leveraging the formula:
  Profit = (Mandi Price - User Crop Cost) × Quantity.
  The app ranks mandis based on profitability and proximity, providing farmers with actionable recommendations.

- **Navigation:**
  Integration with Google Maps for Navigation enables farmers to access turn-by-turn directions to nearby mandis, simplifying logistics.

- **Recent Recommendations:**
  Recent mandi searches are saved using Shared Preferences, enabling users to review past decisions.

F. Firebase Integration

Firebase serves as the backbone for managing data in the Kisan Buddy project, ensuring seamless real-time synchronization and secure storage of critical information. The application leverages multiple Firebase services, including Firebase Authentication, Firebase Realtime Database, and Firebase Firestore. Each database is utilized for specific functionalities, enabling scalability, reliability, and secure data management.

1. **Firebase Authentication:**
   Firebase Authentication is employed to manage user login and registration securely. It allows farmers to create accounts using email and password, ensuring that only authorized users can access their profiles and personalized recommendations. This service also

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 09 ISSUE: 01 | JAN - 2025 SJIF RATING: 8.448 ISSN: 2582-3930

simplifies user management and ensures compliance with data security standards.

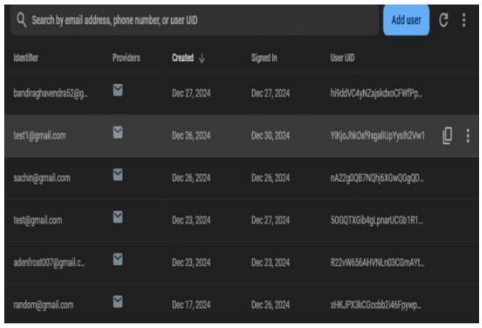


Figure 1: Firebase Authentication (E-mail/password)

2. **Firebase Realtime Database:**
In the Kisan Buddy app, user registration details entered via Register (such as name, email, password, address, city, and phone number) are securely managed using Firebase. Upon successful registration, Firebase Authentication handles email/password verification, while additional user details are stored in the Firebase Realtime Database under a unique user ID. During login, credentials are authenticated through Firebase, and user-specific information is fetched from the database for personalized interactions. This integration ensures secure user authentication and dynamic data management, enhancing the app's functionality and user experience.

Figure 2: Firebase Realtime database

3. **Firebase Firestore:**
Firestore is employed as the primary cloud database to store mandi and crop data.
- **Mandis Data:** Stores comprehensive details about mandis, such as state, district, market name, crop name, and price. This data is dynamically retrieved and displayed to users in the application.
- **Crops Collection**: Farmers' entered crop details, such as crop name, quantity, and cost, are stored in this collection. This data is later used to compute profitability and generate personalized recommendations.

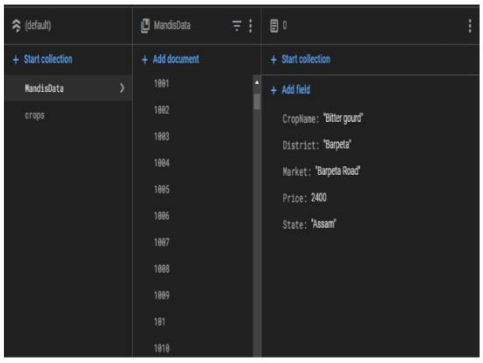


Figure 3: Firestore database

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 09 ISSUE: 01 | JAN - 2025 SJIF RATING: 8.448 ISSN: 2582-3930

G. Workflow

1. User Authentication

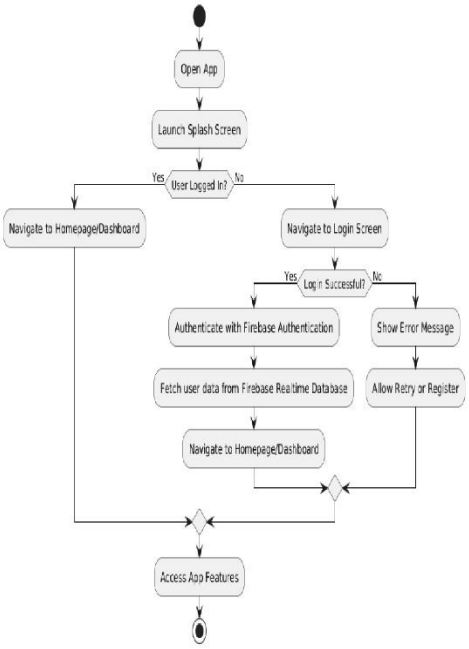


Figure 4

This flowchart (fig.4) outlines the user authentication and navigation process in the Kisan Buddy app. When the app is launched, it displays a splash screen and checks if the user is already logged in. If logged in, the user is directed to the homepage/dashboard; otherwise, they are redirected to the login screen. Upon entering credentials, Firebase Authentication verifies them, and user data is retrieved from the Firebase Realtime Database. Successful login navigates the user to the homepage/dashboard, while failed login prompts an error message with options to retry or register. Once logged in, users can access various app features seamlessly. This process ensures secure and efficient user management.

2. Crop Information and Mandi Recommendation

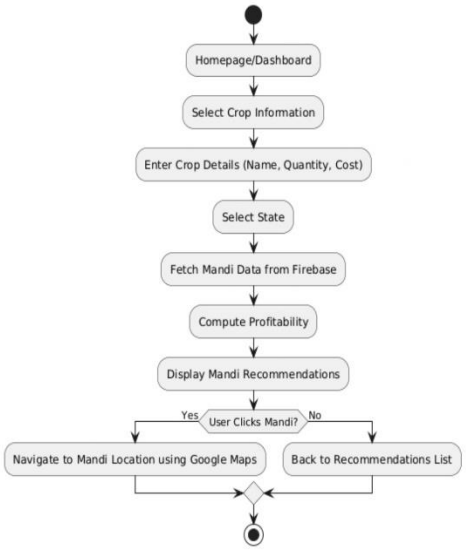


Figure 5

This flowchart (fig.5) illustrates the process of managing crop information in the Kisan Buddy app. Starting from the homepage/dashboard, the user selects the crop information feature and enters crop details, including name, quantity, and cost. The user then selects the state, after which mandi data is fetched from Firebase. Profitability is computed, and a list of recommended mandis is displayed. If the user clicks on a mandi, they are navigated to its location via Google Maps; otherwise, they are directed back to the recommendations list. This streamlined workflow enables efficient decision-making for farmers.

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 09 ISSUE: 01 | JAN - 2025 SJIF RATING: 8.448 ISSN: 2582-3930

H. *Testing and Optimization*

The application was tested for usability, functionality, and performance. A focus group of farmers provided feedback, leading to iterative improvements. Optimization techniques such as efficient data queries and caching mechanisms were implemented to enhance responsiveness.

V. RESULTS

The Kisan Buddy project effectively addresses critical agricultural challenges through a mobile application that provides real-time mandi information, cost estimation, and transaction tracking. Firebase Authentication ensures secure user login and registration, while Firebase Realtime Database and Firestore enable seamless retrieval of mandi data, including recommended mandis highlighted in green on the user interface for improved decision-making.

Figure 6: Mandi Recommendation

The app's features were tested for functionality, confirming the accuracy of mandi recommendations and the efficiency of real-time data updates. Performance tests demonstrated scalability and reliable backend operations with Firebase, handling concurrent user requests effectively. The user interface proved intuitive and user-friendly during testing, enhancing usability among farmers.

Preliminary evaluations indicate that Kisan Buddy supports better financial planning and market decision-making, empowering users with actionable insights. The app highlights its potential to transform agricultural practices, laying a foundation for future enhancements, including multilingual support and advanced analytics.

CONCLUSION

The Kisan Buddy project represents a significant advancement in empowering Indian farmers by addressing critical challenges in accessing mandi information, calculating profitability, and navigating logistical barriers. By leveraging modern technologies such as Firebase Firestore, Firebase Realtime Database, Google Maps for navigation, and secure Firebase Authentication, the application provides a comprehensive and user-centric platform that ensures real-time access to mandi prices, accurate profitability calculations, and efficient data-driven recommendations. The farmer-centric design, coupled with seamless integration of features like dynamic filtering, sorting, and historical data maintenance, enhances user experience and fosters informed decision-making. Through its scalable architecture and robust backend, Kisan Buddy simplifies complex market dynamics, making agricultural trade more efficient and transparent. The application contributes to improving the financial stability of farmers, enhancing productivity, and fostering

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 09 ISSUE: 01 | JAN - 2025 SJIF RATING: 8.448 ISSN: 2582-3930

sustainable agricultural practices, aligning with broader developmental goals in India.

FUTURE SCOPE

While Kisan Buddy has achieved its foundational goals, there is significant potential for further development. Future iterations could introduce multilingual support to cater to the diverse linguistic needs of Indian farmers, thereby expanding accessibility. The integration of advanced data analytics and predictive modeling could provide insights into future mandi price trends, helping farmers plan their produce and sales strategies effectively. Furthermore, incorporating weather forecasting and crop health monitoring features using IoT sensors and AI technology could elevate its utility. Finally, collaborations with government bodies and agricultural organizations could enhance the accuracy and reach of the platform, solidifying Kisan Buddy as a transformative tool in the agricultural domain.

REFERENCES

[1] Agarwalla, A. (2015). Independent work report: Kisan Network (Hindi for "Farmer Network"). Princeton University, Department of Computer Science. Retrieved from https://www.cs.princeton.edu/~rdondero/iw/15Agarwalla.pdf

[2] Haseemun, P., & Somasekhar, K. (2019). A study of Farmers Buddy app development. *International Journal of Computer Sciences and Engineering, 7*(Special Issue 6), 173–175. https://doi.org/10.26438/ijcse/v7si6.173175

[3] Kambale, P., Dharma Raj, B. M., Patil, D., & Ganavi, N. R. (2024). Mobile technology for farmers: An overview of agricultural apps. Asian Journal of Agricultural Extension, Economics & Sociology, 42(9), 75–81. https://doi.org/10.9734/ajaees/2024/v42i92543

[4] Khawas, C., & Shah, P. (2018). Application of Firebase in Android app development: A study. International Journal of Computer Applications. https://doi.org/10.5120/ijca2018917200

[5] Kumari, D. (2022). A study of agriculture-related mobile apps and its impact on farming system. DDU Gorakhpur University. IJCRT, 10(2). https://ijcrt.org/papers/IJCRT2202239.pdf

[6] Mohan, C. R., Kumar, C. S., Chowdary, K. L. N., Ganesh, K. V. S., & Narahari, C. V. (2024). Farmers Buddy: Farmers Online Selling Application. *International Journal of Research in Engineering, IT and Social Sciences, 14*(06), 29–37. Retrieved from https://www.indusedu.org/pdfs/IJREISS/IJREISS_4234_61801.pdf

[7] Nimje, M., & Wankhede, P. (2019). Farmer Buddy. In R. Babu (Ed.), National Conference on "Recent Advances in Engineering and Technology" (SAMMANTRANA 19) (Vol. 4, No. 8). International Journal of Innovations in Engineering and Science. Retrieved from https://www.ijies.net/finial-docs/finial-pdf/220519CS10.pdf

[8] Oteyo, I.N., Marra, M., Kimani, S. et al. A Survey on Mobile Applications for Smart Agriculture. SN COMPUT. SCI. 2, 293 (2021). https://doi.org/10.1007/s42979-021-00700-x

[9] Prof., Gorde, Vaishali, S.., Bidgar, Gaurav, D.., Pangavhane, Kalyani, K.., Shinde, Pranali, S.., Jeughale, Ashish, M.. (2024). Farmer Application. International Journal of Advanced Research in Science, Communication and Technology, doi: 10.48175/ijarsct-17280

Saraf, P. R., Jadhao, S. M., Wanjari, S. J., Kolwate, S. G., & Patil, A. D. (2022). A review on Firebase (Backend as a Service) for mobile application development. *International Journal for Research in Applied Science & Engineering Technology (IJRASET, 10*(1), 967–973. Retrieved from https://www.ijraset.com/best-journal/firebase-backend-as-a-service-for-mobile-application-development

3. Journal publication Certificates

DOI: 10.55041/IJSREM40773

ISSN: 2582-3930

Impact Factor: 8.448

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING & MANAGEMENT

An Open Access Scholarly Journal || Index in major Databases & Metadata

CERTIFICATE OF PUBLICATION

International Journal of Scientific Research in Engineering & Management is hereby awarding this certificate to

Shaik Akram

in recognization to the publication of paper titled

KISAN BUDDY

published in IJSREM Journal on Volume 09 Issue 01 January, 2025

www.ijsrem.com

Editor-in-Chief
IJSREM Journal

e-mail: editor@ijsrem.com

DOI: 10.55041/IJSREM40773

ISSN: 2582-3930

Impact Factor: 8.448

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING & MANAGEMENT

An Open Access Scholarly Journal || Index in major Databases & Metadata

CERTIFICATE OF PUBLICATION

International Journal of Scientific Research in Engineering & Management is hereby awarding this certificate to

Bandi Raghavendra

in recognization to the publication of paper titled

KISAN BUDDY

published in IJSREM Journal on Volume 09 Issue 01 January, 2025

www.ijsrem.com

Editor-in-Chief
IJSREM Journal

e-mail: editor@ijsrem.com

SUSTAINABLE DEVELOPMENT GOALS (SDGS)

The project work carried out here aligns with several United Nations Sustainable Development Goals (SDGs), emphasizing its relevance to societal and global challenges.

SDG-1: No Poverty

SDG 1 focuses on eradicating poverty in all its forms everywhere. Kisan Buddy addresses the economic vulnerabilities faced by farmers in rural areas by providing tools for better decision-making and access to profitable markets. By empowering farmers with actionable insights, real-time data, and enhanced productivity, the project contributes to improving livelihoods and reducing poverty in agricultural communities.

SDG-8: Decent Work and Economic Growth

SDG 8 aims to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. The project directly contributes to reducing inequalities in market access, fostering economic stability in rural agricultural communities.

SDG-9: Industry, Innovation, and Infrastructure

SDG 9 emphasizes the importance of fostering resilient infrastructure, promoting inclusive and sustainable industrialization, and encouraging innovation. *Kisan Buddy* integrates modern technologies like Firebase, Android development tools, and Google Maps to create a robust platform for farmers. This innovative approach strengthens the agricultural supply chain, enhances accessibility, and supports rural economic infrastructure development.

SDG-10: Reduced Inequalities

SDG 10 focuses on reducing inequalities within and among countries. *Kisan Buddy* democratizes access to market information and profitability tools for farmers, regardless of their geographical or socio-economic status. By ensuring that small and marginal farmers can compete effectively in larger markets, the project bridges the gap in resource and knowledge disparities, fostering greater inclusivity in the agricultural sector.

SDG-17: Partnerships to Achieve the Goals

SDG 17 emphasizes strengthening partnerships for sustainable development. *Kisan Buddy* relies on data from the Open Government Data (OGD) Platform India and integrates various technologies, including Firebase and Google Maps, to achieve its objectives. By leveraging partnerships with data platforms and technology providers, the project creates a collaborative ecosystem that enhances its effectiveness and scalability in promoting agricultural development.