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Kuya Connect: An AI-Powered Mobile Platform for Farmer–Buyer Interaction and Smart Crop Advisory Using Real-Time Weather Data

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ABSTRACT: Agriculture plays a crucial role in the economic development of developing countries; however, farmers often face significant challenges such as delayed crop disease identification, unpredictable weather conditions, and lack of direct market access. These issues frequently lead to crop losses and reduced profitability due to dependency on intermediaries and limited technical knowledge. To address these challenges, this paper presents *Kuya Connect*, an AI-powered mobile platform designed to provide real-time agricultural advisory and direct farmer–buyer interaction. The proposed system integrates a cross-platform mobile application developed using Flutter with a cloud-based backend implemented in Python Flask and a MySQL database. The platform utilizes real-time geolocation data to retrieve environmental parameters through a weather service API and employs a generative AI-based advisory engine to analyze crop conditions and provide disease diagnosis and treatment recommendations. Additionally, the system offers daily automated agricultural notifications and enables farmers to connect directly with buyers, thereby reducing the dependency on middlemen.

A prototype implementation was developed and functionally tested to evaluate system performance. The advisory responses generated by the AI module were compared with publicly available agricultural recommendations and demonstrated consistent and relevant outputs. The results indicate that the proposed system can assist farmers in early decision-making, improve crop management practices, and enhance market accessibility. The developed platform demonstrates the potential of integrating generative AI and real-time environmental data into mobile agricultural support systems, contributing to the advancement of smart agriculture solutions.

KEYWORDS: Smart Agriculture, Generative AI, Crop Disease Advisory, Farmer–Buyer Marketplace, Flutter Mobile Application, Weather-Based Recommendation, Decision Support System, Precision Farming

I. INTRODUCTION

Agriculture is one of the primary sources of livelihood in developing countries, particularly in India, where a large portion of the population depends on farming for income and food security. Despite technological advancements in various sectors, small and marginal farmers still face numerous challenges such as lack of timely crop disease identification, limited access to agricultural experts, unpredictable climatic conditions, and difficulty in obtaining fair market prices for their produce. These challenges often lead to reduced crop yield, financial instability, and dependency on intermediaries.

In many rural areas, farmers rely on traditional knowledge or local vendors for crop treatment recommendations. Incorrect diagnosis of crop diseases and improper use of fertilizers or pesticides frequently result in crop damage and increased cultivation costs. Furthermore, farmers often do not have direct communication with potential buyers and must depend on middlemen, which reduces their overall profit. Another major factor affecting agriculture is weather

variability. Sudden changes in temperature, rainfall, and humidity can significantly influence crop health and productivity, but farmers typically lack access to real-time environmental insights and actionable guidance.

Recent advancements in Artificial Intelligence (AI), cloud computing, and mobile technologies have enabled the development of intelligent decision support systems for agriculture. Mobile applications combined with AI-based advisory systems can provide farmers with instant recommendations regarding crop care, disease treatment, and preventive measures. Generative AI models are capable of analyzing agricultural queries and producing context-aware recommendations, while real-time weather data integration allows farmers to take preventive actions based on environmental conditions.

This paper proposes *Kuya Connect*, an AI-powered mobile agricultural platform designed to assist farmers in crop management and market accessibility. The system integrates a cross-platform Flutter mobile application with a Python Flask backend and a MySQL database. The platform collects user location data to retrieve real-time weather information and utilizes a cloud-based AI advisory engine to provide crop disease diagnosis and treatment suggestions. Additionally, the platform establishes direct communication between farmers and buyers, thereby reducing the dependency on intermediaries and improving profitability.

The objective of the proposed system is to provide a unified solution that combines agricultural advisory services with a digital marketplace. By integrating generative AI with real-time environmental data and mobile accessibility, the platform aims to support informed decision-making, early disease prevention, and improved market linkage for farmers. The proposed approach demonstrates how modern AI technologies can be utilized to enhance productivity and sustainability in smart agriculture systems.

II. LITERATURE SURVEY

The application of information and communication technologies in agriculture has gained significant attention in recent years. Researchers have explored various approaches including machine learning, mobile computing, and decision support systems to improve crop productivity and farmer awareness.

Several studies have proposed machine learning-based crop disease detection systems using image processing techniques. Convolutional Neural Network (CNN) models have been widely used to identify plant diseases from leaf images and provide treatment recommendations. These systems demonstrated good accuracy in laboratory environments; however, they require trained datasets, high computational resources, and are often not easily accessible to small-scale farmers in rural areas.

Mobile-based agricultural advisory systems have also been developed to provide farmers with crop management information. These applications typically deliver static recommendations or rule-based suggestions. Although helpful, such systems lack real-time adaptability and do not consider environmental conditions such as weather variability and geographical location, which are critical factors influencing crop health.

Researchers have further explored the use of weather data analysis for predicting crop suitability and improving agricultural planning. Weather-based advisory platforms use environmental parameters like temperature, rainfall, and humidity to guide farmers in irrigation and crop management. However, many existing systems function only as monitoring tools and do not provide personalized recommendations or interactive assistance.

Recent advancements in Artificial Intelligence, particularly generative AI and cloud-based intelligent services, have enabled the development of conversational advisory platforms capable of understanding user queries and producing context-aware responses. These systems can assist farmers by answering agricultural questions and suggesting preventive measures. Nevertheless, most of these solutions operate as standalone advisory tools and do not integrate market linkage or buyer communication.

Additionally, digital agricultural marketplaces have been introduced to connect farmers directly with consumers and buyers. While these platforms improve market accessibility, they generally lack intelligent advisory support and environmental analysis features. Farmers still need to rely on external sources for crop care decisions.

From the existing literature, it is observed that current agricultural systems address individual problems such as disease detection, weather monitoring, or online marketplaces separately. There is a lack of a unified platform that combines real-time advisory services, environmental awareness, and direct farmer–buyer interaction in a single mobile application. To overcome these limitations, the proposed system integrates generative AI-based crop advisory, location-aware weather analysis, and a digital marketplace into a single intelligent agricultural support platform.

III. PROBLEM STATEMENT

Farmers, especially in rural regions, face multiple challenges in crop management and marketing due to limited access to expert guidance and reliable information sources. Early identification of crop diseases is often difficult, and incorrect treatment practices lead to reduced yield and increased production cost. Additionally, unpredictable weather conditions such as sudden rainfall, temperature variation, and humidity changes significantly affect crop health, but farmers typically do not receive timely and location-specific advisories.

Existing agricultural solutions mainly focus on a single aspect such as disease detection, weather monitoring, or online crop selling platforms. These systems operate independently and require farmers to use multiple applications or depend on external intermediaries. As a result, farmers lack an integrated platform that can simultaneously provide real-time crop advisory, environmental awareness, and direct market access.

Therefore, there is a need for a unified intelligent agricultural system that can analyze environmental conditions, provide AI-based crop disease recommendations, and facilitate direct interaction between farmers and buyers through a mobile platform. The proposed system addresses this gap by integrating generative AI advisory services, real-time weather data, and a digital farmer–buyer marketplace within a single application.

IV. PROPOSED SYSTEM

A. System Overview

The proposed system, *Kuya Connect*, is an AI-powered mobile agricultural platform designed to assist farmers in crop management and enable direct interaction between farmers and buyers. The system integrates real-time environmental monitoring, intelligent advisory services, and a digital marketplace within a single mobile application. The application is developed as a cross-platform mobile system using Flutter, while the backend services are implemented using a Python Flask server connected to a MySQL database. The platform allows farmers to register, maintain crop information, and receive agricultural guidance. Buyers can browse listed crops and communicate directly with farmers, thereby reducing reliance on intermediaries and improving transparency in agricultural transactions.

The system utilizes location services available in the mobile device to obtain the geographical coordinates of the farmer. Based on the location, environmental parameters such as temperature, humidity, and rainfall are retrieved using a weather data service. These parameters are analyzed to generate context-aware agricultural recommendations.

An AI-based advisory module is integrated into the system through a cloud-based generative AI service. Farmers can enter crop-related queries, and the advisory module provides recommendations regarding crop diseases, preventive measures, fertilizers, and treatment practices. The system also provides periodic notifications and daily agricultural advisories to help farmers take timely actions. The integration of real-time weather information, intelligent advisory services, and a digital marketplace makes the proposed platform a comprehensive agricultural decision support system aimed at improving productivity and market accessibility for farmers.

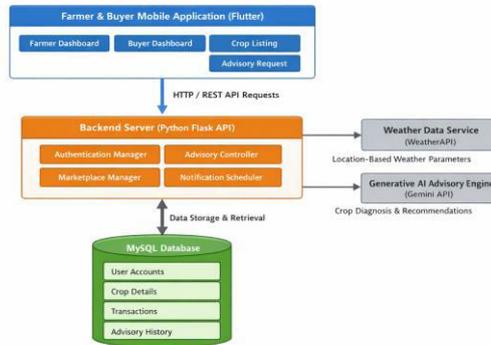


Fig. 1. System Architecture of the Proposed Kuya Connect Platform.

B. Use Case Diagram

The use case diagram represents the interaction between users and the proposed system. The system has two primary actors: **Farmer** and **Buyer**.

The farmer can perform operations such as account registration, login, adding crop details, requesting crop advisory, viewing weather-based recommendations, and receiving daily notifications. The buyer can register, log in, browse available crops, and contact farmers for purchasing.

The system processes user requests through the backend server, retrieves environmental data from the weather service, and generates advisory responses using the AI advisory module. The use case diagram illustrates the functional behavior of the system and the services provided to each user role.

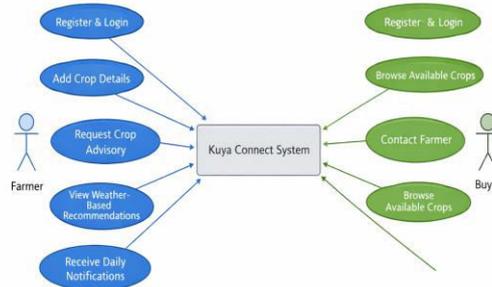


Fig. 2. Use Case Diagram of the Proposed Kuya Connect Platform.

V. METHODOLOGY

The methodology of the proposed Kuya Connect platform describes the operational workflow of the system from user interaction to advisory delivery. Unlike traditional machine learning training-based systems, the proposed platform operates as a real-time agricultural decision support system that integrates mobile services, environmental data acquisition, and AI-based advisory generation.

1) A. User Interaction and Request Initiation

The process begins when the farmer opens the mobile application and logs into the system using registered credentials. After successful authentication, the farmer accesses the dashboard and submits a crop-related advisory request. The request may include crop name, symptoms, or agricultural queries. The mobile application sends the request to the backend server through REST API communication.

2) B. Location Detection and Environmental Data Acquisition

Once the farmer logs in, the system obtains permission to access the mobile device's GPS service. The application retrieves the geographical coordinates (latitude and longitude) of the farmer's location. These coordinates are transmitted to the backend server, which forwards the location data to the weather service API.

The weather service returns environmental parameters such as temperature, humidity, and rainfall conditions. These environmental attributes are essential in understanding crop health conditions and are used to generate context-aware recommendations for the farmer.

3) C. AI-Based Advisory Processing

After receiving the farmer's query, the backend server forwards the request to the cloud-based generative AI advisory engine. The AI engine processes the agricultural query using natural language understanding and produces crop-related recommendations, including disease identification, treatment measures, fertilizer suggestions, and preventive actions.

The advisory response is received by the backend server, formatted appropriately, and transmitted back to the mobile application. The farmer can then view the recommendations directly within the application interface.

4) D. Marketplace Data Handling

Farmers can add crop details such as crop type, quantity, and expected price through the application. This information is stored in the MySQL database and made accessible to registered buyers. Buyers can browse available crops and communicate with farmers for purchasing purposes. This module enables transparent communication and minimizes the role of intermediaries.

5) E. Notification and Advisory Scheduling

The backend server includes a scheduling mechanism that periodically generates daily agricultural notifications. Based on environmental data and previous advisory history, the system sends alerts and reminders to farmers. These notifications help farmers take timely preventive measures and improve crop management practices.

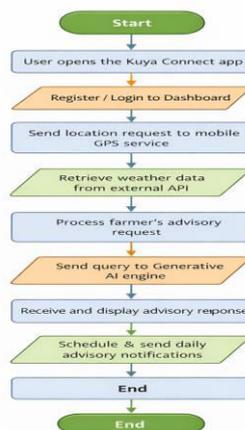


Fig. 3. Workflow of the Proposed Agricultural Advisory System

The workflow of the complete system operation is illustrated in Fig. 3. The integration of location-based environmental analysis and AI-generated advisory enables real-time agricultural assistance and supports informed decision-making by farmers.

V. EXPECTED OUTCOMES

The proposed Kuya Connect platform is expected to improve agricultural decision-making by providing farmers with timely and accessible guidance. The integration of real-time environmental information and AI-based advisory services

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enables farmers to receive recommendations regarding crop care, disease prevention, and treatment methods without requiring direct access to agricultural experts.

During prototype testing, the system successfully retrieved location-based weather information and generated advisory responses for user queries. The AI advisory module produced relevant suggestions for crop-related questions, and the responses were consistent with publicly available agricultural recommendations. The platform also demonstrated proper functioning of user authentication, crop listing, and buyer browsing features.

The farmer–buyer marketplace is expected to improve transparency in agricultural transactions by allowing direct communication between farmers and buyers. By reducing reliance on intermediaries, farmers may obtain better pricing for their produce and increase profitability.

The notification module is expected to assist farmers in taking preventive actions through periodic alerts and daily advisory messages. Timely reminders related to environmental conditions and crop management can help reduce crop damage caused by weather variations and improper treatment practices.

Overall, the proposed system is expected to enhance accessibility to agricultural knowledge, improve crop management practices, and promote digital agricultural marketplaces. The integration of AI-based advisory, environmental monitoring, and mobile accessibility demonstrates the potential of the system to support smart agriculture initiatives and sustainable farming practices.

VII. CONCLUSION

This paper presented *Kuya Connect*, an AI-powered mobile platform designed to support farmers in crop management and improve market accessibility through a digital farmer–buyer interaction system. The proposed system integrates real-time weather information, location-based analysis, and a generative AI advisory module to provide agricultural recommendations and preventive guidance to farmers.

A prototype implementation was developed using a Flutter-based mobile application with a Python Flask backend and a MySQL database. The system successfully demonstrated functionalities such as user authentication, crop listing, location-based weather retrieval, AI-based advisory generation, and periodic notification delivery. The advisory responses provided by the AI module were found to be relevant and helpful for crop-related queries during testing. The proposed platform reduces the dependency on intermediaries by enabling direct communication between farmers and buyers while also assisting farmers in making informed decisions regarding crop care and disease prevention. The integration of intelligent advisory services and real-time environmental monitoring highlights the potential of modern AI technologies in improving agricultural productivity and sustainability.

Therefore, the proposed system contributes toward the development of smart agriculture solutions by providing an accessible and practical digital support platform for farmers.

VIII. FUTURE ENHANCEMENTS

Although the proposed *Kuya Connect* platform demonstrates effective functionality, several improvements can be incorporated in future work to enhance usability and performance. The system can be extended by integrating image-based crop disease detection, where farmers can upload leaf photographs and receive automated disease identification using computer vision techniques.

The platform can also be improved by supporting multiple regional languages to assist farmers who are not comfortable with English-based interfaces. Voice-based query input can further improve accessibility for farmers with limited technical literacy.

In future implementations, real-time market price integration from government agricultural databases and mandis can be included to help farmers make better selling decisions. Additionally, integration with digital payment gateways and logistics services can enable complete online transactions between farmers and buyers.

The advisory module can be enhanced by incorporating historical weather forecasting and predictive analytics to provide early warnings related to pest outbreaks, drought conditions, and heavy rainfall. IoT sensor integration, such as soil moisture and soil nutrient monitoring, can further improve precision farming capabilities. These enhancements would transform the proposed system into a comprehensive smart agriculture ecosystem capable of supporting large-scale agricultural communities and sustainable farming practices.

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