IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 5, May 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105199 |

Agro Dev App: Innovative Solution to Manage Crops

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ABSTRACT: This paper introduces an innovative Agriculture app designed to empower farmers in the agriculture sector. The app aims to assist farmers and agriculture enthusiasts in planning their crops effectively and optimizing yield and profitability. It features a comprehensive crop database categorized by season, region, and type, providing detailed information on growth requirements, optimal sowing time, and expected harvest dates for each crop. By utilizing smartphone functions, versatile mobile agriculture applications can be built to deliver essential crop and management information. This paper presents the development of Agro Dev App, an Android/iOS application for smart farming in crop management. Developed using Flutter, a software used for creating mobile applications, the Agro Dev App simplifies farm management for farmers. The results of this project include a mobile application that facilitates crop management, crop location tracking, identification of seasonal crops, and overall improvement in farm management practices.

KEYWORDS: Smart agriculture, agriculture technology, mobile application, crop management.

I. INTRODUCTION

Agro Dev App is Mobile Application which will help farmers to improve productivity of the crops and it will provide farmers with real-time data and analytics to optimize their farming practices.This includes information about weather patterns, soil conditions, pest and disease outbreaks, and optimal planting and harvesting times.By leveraging such data, farmers can make informed decisions to enhance crop yields and overall productivity.

The motivation behind this project is to leverage technology and information to empower farmers, improve agricultural practices, enhance productivity and profitability, promote sustainability, and address the challenges faced by the global food system. The Main Problem Statement of our project is to Design a layout to select crop & also design a layout to select sowing date for crop.

The objective of our project is to ease the burden on farmers by providing them with sufficient knowledge about crops (their seasons, soil type, amount of water required etc.).The information will help farmers by reducing production costs, complying with agricultural standards, and maintain high product quality and safely. The Scope behind our project is to help the farmers in agricultural assistance and enthusiasts in selecting the right crops, determining the optimal sowing time, and understanding soil suitability based on water content. By leveraging advanced algorithms and agricultural data, the app aims to enhance agricultural productivity, sustainability, and overall crop yield.

II. RELATED WORK

In the paper titled "Ecofert: An Android application for the optimization of fertilizer cost in fertilization" by M.V. Bueno-Delgado, J. M. Molina-Martínez, R. Correoso-Campillo, and P. Pavón-Mariño (2015) [9], the authors focus on efficient fertilizer management to save time and money. They present Ecofert, an easy and powerful software application for Android OS that calculates the optimal combination of fertilizers to achieve the desired nutrient solution for different crops. The application takes into account the current prices of fertilizers in the market. Ecofert solves the fertilization mixture by modeling it as a Linear Programming problem and utilizes specific mathematical libraries for resolution. It operates with a list of marketable fertilizers stored in a Cloud-based database, which is updated daily with composition and cost information. Ecofert exhibits low computational cost even for a large number of fertilizers (>20), and its simplicity allows for easy execution on mobile devices, providing farmers and crop growing technicians with a powerful tool for agricultural tasks.

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In the paper titled "Agro Mobile: A Cloud-Based Framework for Agriculturists on Mobile Platform" by Shitala Prasad, Sateesh K. Peddoju, and Debashis Ghosh (2013) [8], the authors explore various ways in which farmers can utilize Mobile Cloud Computing (MCC) on their handsets through an application called Agro Mobile. This mobile application is highly useful in assisting farmers with improved cultivation and marketing practices. The focus of this work is on crop image analysis. Image processing techniques typically require significant computational power and memory, which is not feasible on mobile devices. To overcome this limitation, the framework leverages the concept of MCC, enabling the cloud to be accessible on a farmer's mobile device. Android-based mobile devices are used for this research.

In the paper titled "E-Agro Android Application" (Integrated Farming Management Systems for sustainable development of farmers) by Shubham Sharma, Viraj Patodkar, Sujit Simant, Chirag Shah, and Prof. Sachin Godse (2015) [7], the authors introduce a software application essential for the sustainable growth of farmers. The application addresses the problem of farmers being confused when making decisions regarding pesticide and fertilizer selection, as well as determining the appropriate timing for farming actions. This application provides a useful solution for farmers by registering fertilizer schedules for various crops. Based on the sowing date of a crop, farmers receive reminder to use fertilizers according to the plan. Additional advice is also provided based on soil type, climatic conditions, and other factors. This system integrates modern internet techniques, mobile communication systems, and GPS for efficient and smooth farming processes.

III. METHODOLOGY

Our project aims to develop an application that assists users in crop cultivation by providing them with relevant information. The key features of the app include details about seasonal crops, the regions where each crop thrives, and specific information abut sowing and harvesting dates.

To implement our project, we utilized Flutter Technology, which offers cross-platform support for Android, iOS, and web applications. We integrated functionalities such as Sign Up, Login, Crop Details, States, Temperature, and Humidity with Firebase real-time database. The crop information is categorized based on seasons, and the app fetches the crop list from Firebase using a value event listener. The obtained crop information is then displayed to guide farmers. Farmers can also search for crops based on their location. Real-time data is obtained using Flutter's future objects. Additionally, farmers can update and add crops through the mobile app and monitor the growth of their plants.

The mobile application comprises three layers: the presentation layer, application layer, and database layer. The presentation layer is accessed by users through their mobile devices, such as smartphones and tablets. It consists of the User Interface (UI) and its processing components, focusing on how the application is presented to the user. The application layer, or business layer, manages the overall application workflow. This layer includes an application program interface (API) that transfers information to the presentation layer. The database layer stores all the entered information and ensures its security. This layer serves as the core of the mobile application.

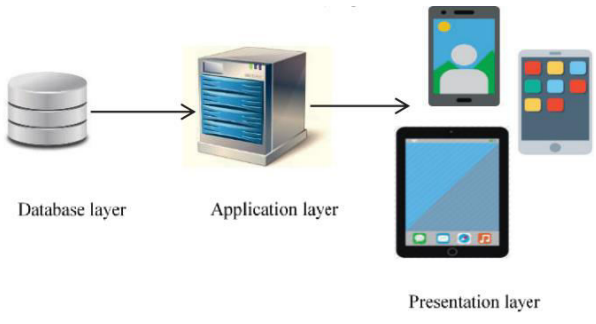

Fig.1. Different Types of Layers

The below Architectural Diagram explains that how user can easily use the App first the user has to login or sign up to the app after that the details of user will be saved in the Firebase database. After Login the user can see the dashboard inside which user can see the recommended crops details as now summer is their it will recommend summer crops and if it will be winter then it will recommend winter crops. The user can also view crops of summer and winter which are not shown in recommended crops. The user can also use the GPS to see the nearby details of crops and what type of soils are present nearby. There is also a drop-down box in which can select state and see the real-time temperature, humidity, and wind speed of the state.

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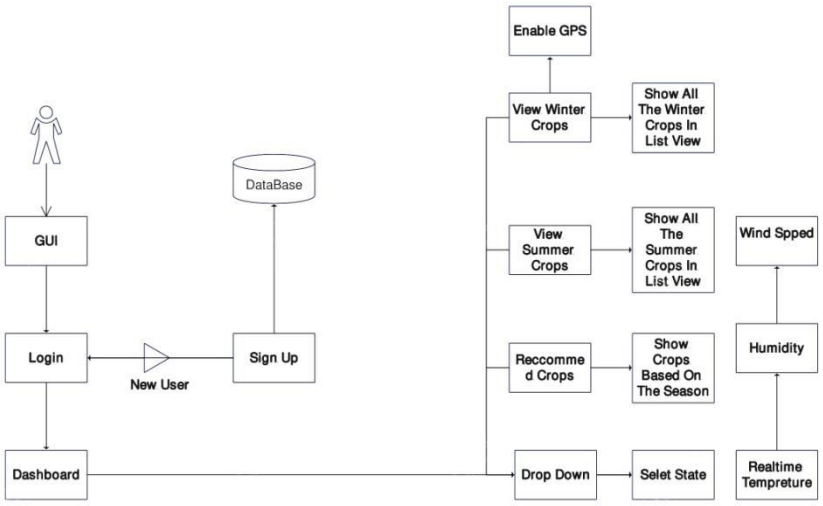

Fig.2. Architectural Diagram

The following use-case diagram illustrates the overall functionality and scope of a system. It outlines the interactions between the system and its actors. Use cases and actors in use-case diagrams depict the actions performed by the system and how actors utilize it, without delving into the internal operations of the system.

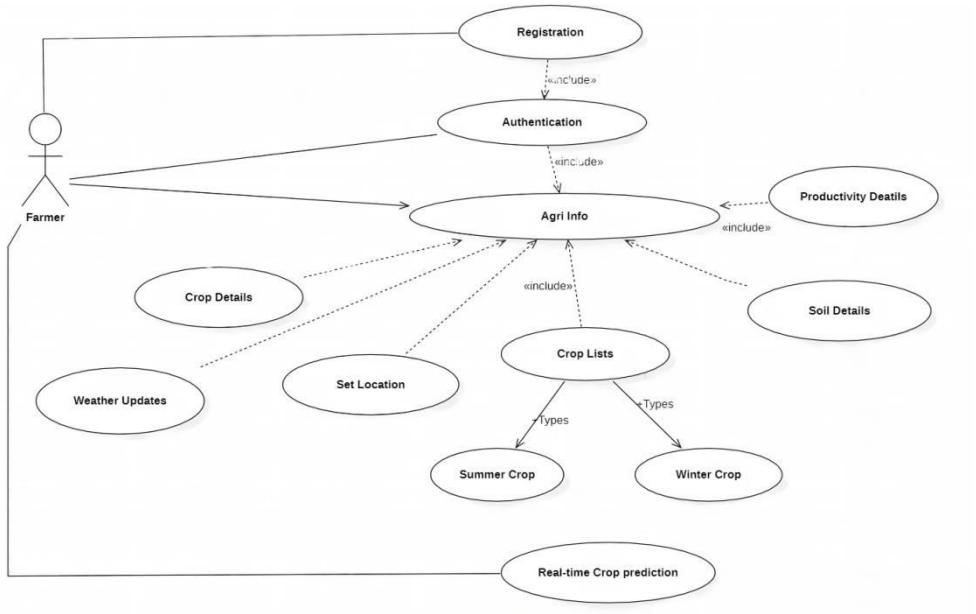

Fig.3. Use-Case Diagram

The activity diagram is a crucial component in UML that portrays the dynamic aspects of a system. It serves as a flowchart, illustrating the sequence of activities within the system. Activities represent system operations, and the control flow depicts the transition from one activity to another. This flow can be sequential, branched, or concurrent. Activity diagrams incorporate various elements such as forks, joins, etc., to handle different types of flow control.

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Activity diagrams are designed to capture the dynamic behavior of the system. While the other four diagrams (class, object, sequence, and collaboration diagrams) focus on illustrating message flow between objects, the activity diagram specifically showcases the flow of activities from one to another.

The Activity diagram represents the stepstaken.

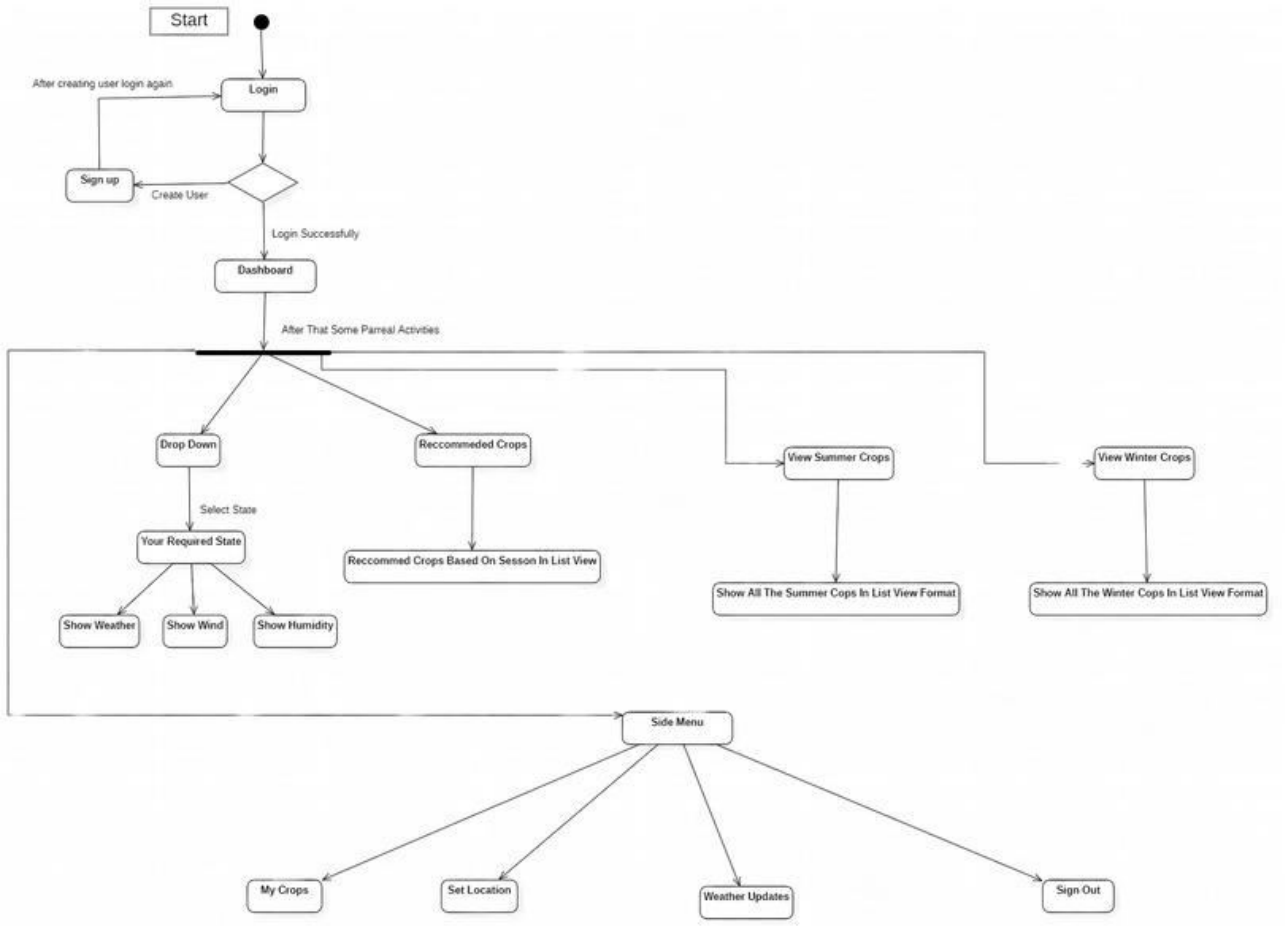

Fig.4. Activity Diagram

IV. RESULTS

The result of our App Agro Dev is that we already know that it is a mobile application developed for farmers and agriculture officers. It was developed to monitor their crops accordingly, and to optimize their yield and profitability. This mobile application can be used both in Android and IOS because we are using Flutter Software. The app will feature an extensive database of crops, recommended crops, crops categorized by season, region, and type, with detailed information on each crop's growth requirements, optimal sowing time, and expected harvest date. We can see Figure 5 about selecting state wise temperature, humidity and wind info. The application is user-friendly and all the information is easy to understand by user. The data in this application is for every seasonal crop. This application requires an Internet connection. We can see in Figure 5 that it is the dashboard of the different seasonal crops. All crops are having its own sowing and harvest date.

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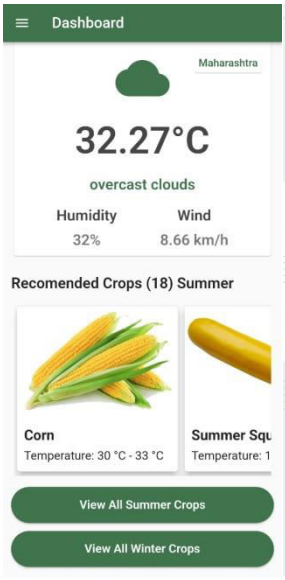

Fig.5. Dashboard

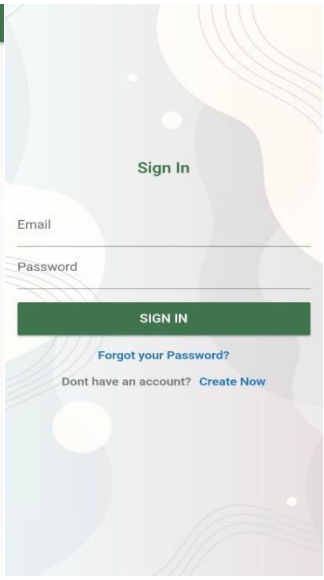

Fig.6. Login/Sign in

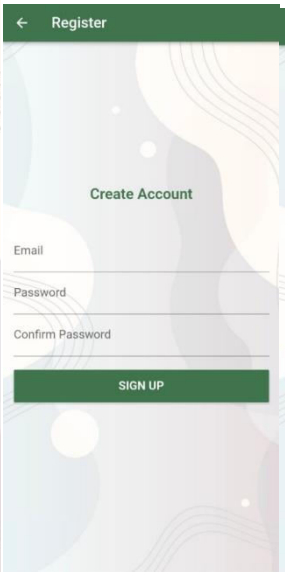

Fig.7. Create Account/Sign up

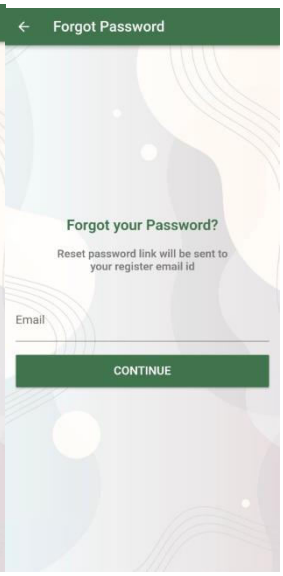

Fig.8. Forgot Password

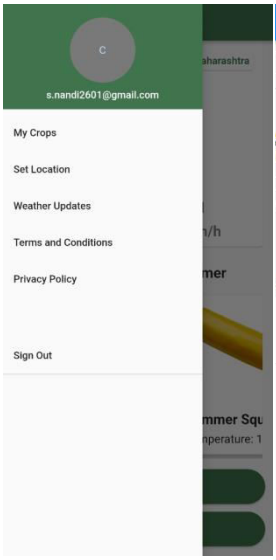

Fig.9. Side Menu

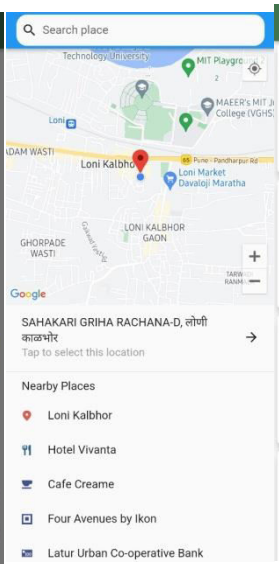

Fig.10. Location

Fig.11. Summer Crops

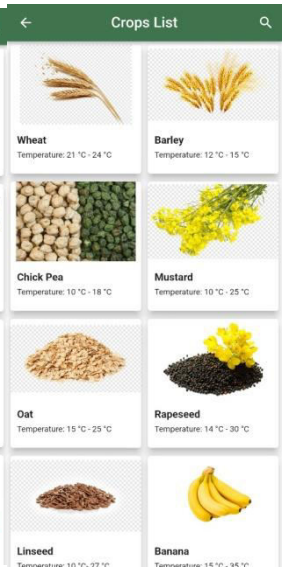

Fig.12. Winter Crops

V. CONCLUSION AND FUTURE WORK

The Crop Selection and Sowing Date App has great potential for future development and growth. Here are some areas where the app can be further enhanced:

1. *Integration of Advanced Machine Learning and AI*: With advancements in technology, the app can incorporate advanced machine learning and AI capabilities. By analyzing user feedback, weather patterns, crop performance data, and other relevant factors, the app can improve the accuracy of its recommendations. AI-powered features like predictive analytics and anomaly detection can provide valuable insights and early warnings for crop diseases, pests, and adverse weather conditions.

2. *Expansion to Different Geographical Regions*: Currently, the app focuses on providing recommendations based on the user's location. However, there is an opportunity to expand its reach to different geographical regions. By

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incorporating data from various regions worldwide and adapting the algorithms to different climate and soil conditions, the app can cater to a broader user base and address the specific challenges faced in different agricultural regions.

3. *Crop Disease and Pest Identification*: Adding a feature that allows users to identify and diagnose crop diseases and pests would be highly beneficial. By utilizing image recognition technology and extensive databases of crop diseases and pests, the app can help users identify common issues affecting their crops. It can provide real-time guidance on effective prevention and treatment methods, enabling farmers to mitigate risks and optimize crop yields.

4. *Integration with IoT and Sensor Technologies*: Embracing IoT and sensor technologies can significantly enhance the app's capabilities. By integrating with smart sensors that monitor soil moisture, temperature, humidity, and other relevant factors, the app can provide users with real-time and accurate information for decision-making. This integration can empower farmers to make informed choices regarding irrigation, fertilization, and other critical factors. Additionally, automated alerts and notifications can be utilized to notify users when specific thresholds are exceeded or critical events occur.

5. *Collaboration with Agricultural Institutions and Experts*: Collaborating with agricultural institutions, research organizations, and industry experts can bring valuable insights to the app. By sharing and integrating data, accessing research findings, and leveraging expert knowledge, the app's recommendations and knowledge base can be continuously improved. This collaboration ensures that the app remains updated with the latest advancements in agriculture and aligns with industry best practices, providing users with reliable and relevant information.

6. *Farm Management and Analytics*: Expanding the app to include farm management and analytics features can empower users to optimize their farming operations. Features like crop yield tracking, expense management, and performance analytics can enable data-driven decision-making. By identifying areas for improvement, optimizing resource allocation, and measuring the effectiveness of different practices, farmers can enhance their efficiency, profitability, and sustainability.In conclusion, the future scope of the Crop Selection and Sowing Date App includes integrating advanced technologies like machine learning and AI, expanding to different geographical regions, incorporating crop disease and pest identification capabilities, integrating IoT and sensor technologies, collaborating with agricultural institutions and experts, and adding farm management and analytics features. These enhancements will improve the functionality and usability of the app, supporting farmers and agricultural enthusiasts in making informed decisions and optimizing their crop cultivation practices.

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ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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