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Green Genie

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Abstract

Green Genie is a mobile-friendly application designed to transform agricultural management for farmers by offering a comprehensive suite of tools tailored to their needs. The app aims to enhance productivity and sustainability in farming through various innovative features. One of the primary functionalities of Green Genie is its crop disease diagnosis system, which employs advanced algorithms to identify potential diseases based on user-submitted images. By providing immediate and actionable recommendations for treatment and fertilizers, the app empowers farmers to tackle crop health issues proactively. In addition to disease management, Green Genie connects farmers with local agricultural experts, facilitating access to professional advice and support. This feature is crucial for farmers seeking guidance on best practices, pest control, and efficient resource utilization. Furthermore, the app offers crop suggestions based on real-time weather data, helping farmers make informed decisions about what to plant and when to harvest. To further enhance user experience, Green Genie incorporates a chatbot designed to answer agricultural queries in real time, providing immediate assistance for common issues and concerns. This multifaceted approach makes Green Genie an invaluable tool for modern farmers, regardless of their scale of operation. By combining these diverse functionalities into a single platform, Green Genie not only addresses the pressing challenges faced by farmers but also fosters a more sustainable agricultural ecosystem. Ultimately, the app is poised to redefine how farmers manage their operations, contributing to greater productivity, profitability, and sustainability in the agricultural sector.

Keywords - AI-powered disease detection, agricultural management, crop disease diagnosis, local agricultural experts, weather data, chatbot, sustainability.

Chapter 01

Introduction

Agriculture is a fundamental pillar of the economy, supporting millions of livelihoods worldwide. However, farmers often face a range of challenges, including unstable market prices, crop diseases, inefficient farm management, and limited access to expert advice. These factors can significantly affect productivity and profitability, especially in developing regions. Modern technology offers a solution to these challenges, enabling smarter farming through data- driven insights and digital tools.

1.1 Project Idea

Green Genie integrates several key features to assist farmers in managing their agricultural operations more effectively. One of its primary functions is the crop disease diagnosis system, which utilizes advanced image recognition technology to identify potential diseases based on user-submitted photographs of affected crops. By providing immediate and actionable recommendations for treatment and fertilizers, the app empowers farmers to address health issues promptly, thereby minimizing crop loss.

In addition to disease management, Green Genie connects farmers with local agricultural experts, allowing them to seek guidance on best practices and resource utilization. The app also offers **crop suggestions** based on real-time weather data, helping farmers make informed decisions about planting and harvesting schedules.

To enhance user interaction and support, Green Genie features a **chatbot** that can answer agricultural queries in real time, ensuring that farmers have immediate access to information and assistance. By combining these diverse functionalities into a single, user-friendly platform, Green Genie aims to redefine agricultural management, contributing to greater productivity, profitability, and sustainability in the agricultural sector.

Chapter 2
Review of Literature

A literature survey was carried out to find various papers published in international journals such as IEEE etc. related to tracing missing people using facial recognition to get the best algorithm for the same.

2.1 Existing System

The existing landscape of agricultural management is characterized by a myriad of tools and technologies that address specific challenges faced by farmers. Current solutions often focus on isolated aspects of farming, such as disease management or market price tracking, rather than providing an integrated approach. For instance, financial management tools enable farmers to track expenses and income, but they frequently lack real-time data integration with market conditions, leaving farmers with incomplete information for decision-making.

In terms of crop disease detection, many traditional methods rely on manual inspections or expert consultations, which can be time-consuming and not timely enough to prevent significant losses. While some applications utilize image recognition technology for disease diagnosis, these systems often do not offer comprehensive treatment recommendations, leaving farmers without actionable solutions. This fragmentation in disease management underscores the need for a holistic solution that can promptly identify issues and suggest appropriate interventions.

Moreover, existing market price tracking platforms often provide generalized data that does not cater to local market dynamics, hindering farmers' ability to make informed selling decisions. Current expert consultation services can also be inefficient, with slow response times and variable quality of advice. This fragmentation across various systems highlights a significant gap in the market, which **Green Genie** aims to fill by offering an integrated platform that combines disease diagnosis, market analysis, financial management, and expert support into a single application. By doing so, Green Genie seeks to empower farmers with the comprehensive tools they need to optimize their agricultural practices and enhance productivity.

2.2 Literature Survey

We have examined various research papers in the domain of Agricultural Apps for our project to delve deeper into the details of the various researches conducted in the field of Agriculture.

Sr. No.	Paper Name	Year of Publication	Author	Publication	Proposed Work	Research Gap
1.	Applied Deep Learning-Based Crop Yield Prediction: A Systematic Analysis of Current Developments and Potential Challenges	2024	Khadija Meghraoui, Imane Sebari, Juergen Pilz, Kenza Ait El Kadi.	MDPI Sensors	Create a novel deep learning framework for crop yield prediction using diverse data sources.	Need for alternative models, data integration, and comparisons with traditional methods.
2.	Improving Wheat Leaf Disease Classification: Evaluating Augmentation Strategies and CNN-Based Models With Limited Dataset	2024	Syed Taha Yeasin Ramadani,Hezerul Bin Abdul Karim, Junaidi Bin Abdullah, Fahmid Al Farid.	IEEE Access	The proposed work seeks to improve wheat disease detection using augmentation methods like SMOTE and GAN for limited sample datasets.	The research gap includes underutilization of CycleGAN for wheat disease identification and insufficient studies on GAN data augmentation and image quality impacts.
3.	A Deep Learning Model for Cotton Disease Prediction Using Fine-Tuning with Smart Web Application in Agriculture	2023	Manowarul Islam, Md. Alamin Talukder, Md. Ashraf Uddin, Arnisha Akhter.	Research Gate	Deep learning model integrated into a web application for predicting cotton diseases	Limited to cotton crops, requires extensive training data
4.	A Review of Successes and Impeding Challenges of IoT-Based Insect Pest Detection	2023	Denis O. Kiobia , Canicius J. Mwitta, Kadeghe G. Fue , Jason M. Schmidt	MDPI Sensors	IoT-based pest detection system for cotton farms	High implementation costs, requires technical expertise

	Systems for Estimating Agroecosystem Health and Productivity of Cotton					
5.	Weather-Based Crop Recommendation Using Random Forest Algorithm"	2023	Pradip Mukundrao Paithane	ITEGAM - jetia	Random Forest algorithm that uses real-time weather data to recommend suitable crops.	Limited to the availability and accuracy of weather data.

Table 2.1 shows survey of the research paper done for the project.

This literature table presents a study by Khadija Meghraoui et al. (2024) that systematically analyzes current developments in deep learning frameworks for crop yield prediction. The research proposes a novel deep learning approach that integrates diverse data sources to enhance the accuracy of yield forecasts. While the framework shows promise in improving predictive capabilities, it underscores several challenges, including the need for alternative modeling techniques, effective data integration strategies, and comparative analyses with traditional yield prediction methods. This highlights the ongoing evolution in agricultural analytics, where the integration of advanced technologies and methodologies is crucial for addressing the complexities of crop yield forecasting.

The study by Syed Taha Yeasin Ramadani et al. (2024) aims to enhance wheat leaf disease classification by employing augmentation methods such as SMOTE and GAN, specifically addressing the challenges of limited sample datasets. The research identifies key gaps, including the underutilization of CycleGAN for disease identification and a lack of comprehensive studies on GAN-based data augmentation and the impact of generated image quality on model performance. This work seeks to fill these gaps and improve the accuracy of convolutional neural network (CNN) models in detecting wheat diseases.

This literature table presents a study by Manowarul Islam et al. (2023) that explores the application of a deep learning model for predicting cotton diseases, integrated into a smart web application tailored for agricultural use. The research focuses on leveraging advanced machine learning techniques, specifically fine-tuning pre-trained models, to enhance prediction accuracy in detecting diseases affecting cotton crops. While the model shows promise in improving disease management and decision-making in agriculture, it is limited to cotton crops and necessitates extensive training data for optimal performance. This highlights the challenges in deploying deep learning solutions in agricultural contexts, where data availability and specificity can significantly impact efficacy.

This literature table summarizes a review by Denis O. Kiobia et al. (2023) that evaluates the successes and challenges associated with IoT-based insect pest detection systems in the context of cotton farming. The study highlights how these systems can enhance the estimation of agroecosystem health and productivity by providing real-time data on pest activity. Despite their potential benefits in improving crop management and sustainability, the implementation of such technologies is hindered by high costs and the need for specialized technical expertise.

This underscores the barriers to widespread adoption of IoT solutions in agriculture, emphasizing the need for more accessible and cost-effective technologies to support farmers.
This literature table details a study by Pradip Mukundrao Paithane (2023) that investigates a weather-based crop recommendation system utilizing the Random Forest algorithm. The research focuses on harnessing real-time weather data to provide tailored crop recommendations, aiming to optimize agricultural productivity and resource management. While the model demonstrates the potential to enhance decision-making for farmers, its effectiveness is constrained by the availability and accuracy of the weather data utilized. This highlights a critical challenge in implementing data-driven agricultural solutions, where the quality and reliability of input data can significantly influence outcomes.

2.3 Problem Statement and Objective

Farmers face significant challenges in managing crop diseases and accessing timely market information, which can lead to reduced yields and missed profit opportunities. Traditional methods of disease diagnosis are often slow and rely on manual inspections, while existing agricultural tools operate in isolation, limiting their effectiveness.
Green Genie aims to address these issues by offering a comprehensive mobile application that integrates essential features. The app will facilitate rapid disease diagnosis using image recognition, and connect farmers with local agricultural experts. By combining these functionalities, Green Genie seeks to enhance productivity and sustainability in agriculture, ultimately improving farmers' livelihoods.

2.4 Project Scope

The scope of Green Genie encompasses a wide range of functionalities designed to support farmers in various aspects of agricultural management. The application is intended for use by small to large-scale farmers, providing tools that enhance decision- making and operational efficiency. Key features include crop disease diagnosis, which utilizes advanced image recognition technology to allow farmers to upload images of affected crops for quick analysis and actionable treatment recommendations. The app also connects users with local agricultural experts, facilitating access to professional advice on best practices, pest management, and resource utilization. By analyzing weather data, the app offers tailored By addressing these areas, Green Genie aims to create a holistic platform that enhances productivity, profitability, and sustainability in agriculture, ultimately contributing to improved livelihoods for farmers.

Chapter 3
Proposed System

The proposed system, **Green Genie**, aims to address the challenges faced by farmers by providing an integrated mobile application that offers a comprehensive suite of tools for agricultural management. This chapter outlines the analysis, framework, system requirements, design details, data model, fundamental model, UML diagrams, and methodology associated with the development of Green Genie.

3.1 Analysis/Framework/ Algorithm

The development of Green Genie involves a thorough analysis of the agricultural landscape to identify the specific needs and challenges faced by farmers. This analysis informs the design of a robust framework that integrates various technologies to provide effective solutions.

The application leverages advanced **image recognition algorithms** for crop disease diagnosis. These algorithms enable users to upload images of affected plants, which are then analyzed to identify potential diseases accurately. The use of machine learning models allows the system to improve its accuracy over time by learning from a growing database of disease images and treatment outcomes. In addition to disease diagnosis, Green Genie employs **data analytics** to provide real-time market insights and crop recommendations. The framework incorporates weather data analysis to suggest optimal planting and harvesting times based on current and forecasted weather conditions.

The overall architecture of Green Genie is designed to be modular, allowing for easy updates and enhancements. Each feature, operates independently but communicates seamlessly with the central database. This modular approach ensures that the application can adapt to evolving user needs and integrate new functionalities as technology advances.

3.2 System Requirements

To effectively implement **Green Genie**, a set of hardware and software requirements must be established to ensure optimal performance and user experience.

3.2.1 Hardware Requirements

This subsection will provide the minimum requirements that must be fulfilled by the hardware components. The hardware requirements are as follows: -

- **User Device**: Users must have a smartphone or tablet or Desktop with a minimum of 4 GB RAM/Windows 10 and a dual-core processor to support smooth operation and quick processing of data.
- **Camera**: A device with a quality camera is essential for uploading clear images of crops for disease diagnosis.
- **Internet Connectivity**: A stable internet connection is required to access real-time data, such as weather updates, and to enable communication with the backend server.

3.2.2 Software Requirements

This subsection will provide the versions of software applications that must be installed. The software requirements are as follows: -

- **Green Genie App**
- **Operating System**: The web-application is designed for Android devices, Tablets and Desktops requiring a minimum OS version of 5.0 (Lollipop)/Windows 10 or higher to ensure compatibility with modern features and functionalities.
- **Backend Server**: A reliable backend server is necessary to handle data processing and storage. This

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server can be cloud-based to provide scalability and flexibility, accommodating varying numbers of users and data loads.

- **Database Management System**: A robust database management system is required to store user data, crop information, and expert consultations, ensuring efficient data retrieval and management.

3.3 Design Details

In design details, we analyse the System Architecture and System Modules in detail. We study the flow and process of the entire project in order to develop the project in an orderly and systematic manner. The design of **Green Genie** focuses on creating a user-friendly and intuitive interface that simplifies agricultural management for farmers. The application is structured to ensure that all features are easily accessible, promoting efficiency and ease of use.

3.3.1 System Architecture

The system architecture of Green Genie consists of three primary components: the mobile client, the backend server, and the database. The mobile client serves as the interface for users, allowing them to interact with various features of the app, such as disease diagnosis, market analysis, and expert consultation. It communicates with the backend server through secure API calls, facilitating data exchange and processing.

The backend server is responsible for handling user requests, running algorithms for disease detection, and managing data flow between the mobile client and the database. It ensures that the application performs efficiently, even with multiple concurrent users. The database serves as the central repository for all user data, crop information, and historical records, ensuring data integrity and accessibility.

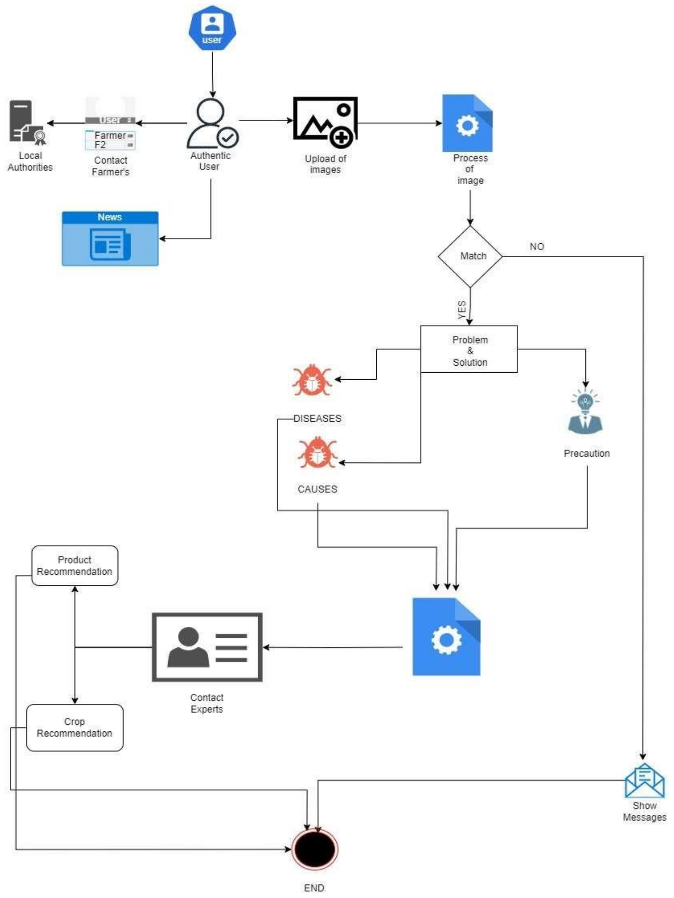

Figure. 3.1 – System Architecture

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3.3.2 System Modules

Green Genie comprises several key modules, each designed to provide specific functionalities that address the various challenges faced by farmers. The integration of these modules creates a comprehensive agricultural management tool.

1. **Disease Diagnosis Module**: This module utilizes advanced image recognition technology to help farmers identify crop diseases. Users can take a photo of the affected plant and upload it to the app. The module analyzes the image against a database of known diseases, providing a diagnosis and suggesting appropriate treatments or preventive measures. This feature allows for quick responses to potential threats, minimizing crop loss and improving yield.
2. **Expert Consultation Module**: In this module, farmers can connect with local agricultural experts for personalized advice and support. Users can submit questions related to pest management, crop selection, or general farming practices. The module facilitates live chat or scheduled consultations, ensuring that farmers receive timely and relevant guidance tailored to their specific circumstances.
3. **Weather Forecast Module**: This module delivers localized weather forecasts and analyses to farmers. By leveraging historical weather data and predictive models, it provides tailored crop suggestions based on the current and upcoming weather conditions. This feature helps farmers plan their planting and harvesting activities more effectively, reducing the risk of crop damage due to adverse weather.
4. **Chatbot Module**: The chatbot feature enhances user interaction by providing immediate responses to common agricultural queries. Powered by natural language processing (NLP) technology, the chatbot can understand and respond to user inquiries related to farming practices, crop care, and the features of the app itself. This module aims to provide users with quick support and improve their overall experience with the application.

By integrating these modules, Green Genie aims to create a cohesive and efficient platform that meets the diverse needs of farmers, ultimately promoting productivity, profitability, and sustainability in agricultural practices.

3.4 Data Model and Description

Data Model describes the relationship and association among data which includes Entity Relationship Model.

3.4.1 Entity Relationship Model

Figure 3.2 illustrates the Entity Relationship Diagram (ERD) of Green Genie, visually representing key entities and their relationships. The main entities include User, Expert, Authority, Chatbot, Image, Disease, Solution, Product Recommendation, and Crop Recommendation. Users interact with the system, while experts and authorities provide guidance. The chatbot assists with queries, and images help in disease detection. The system maintains disease data, solutions, and recommendations for crops and products. This structured design ensures efficient data flow, enabling informed agricultural decisions and better farm management.

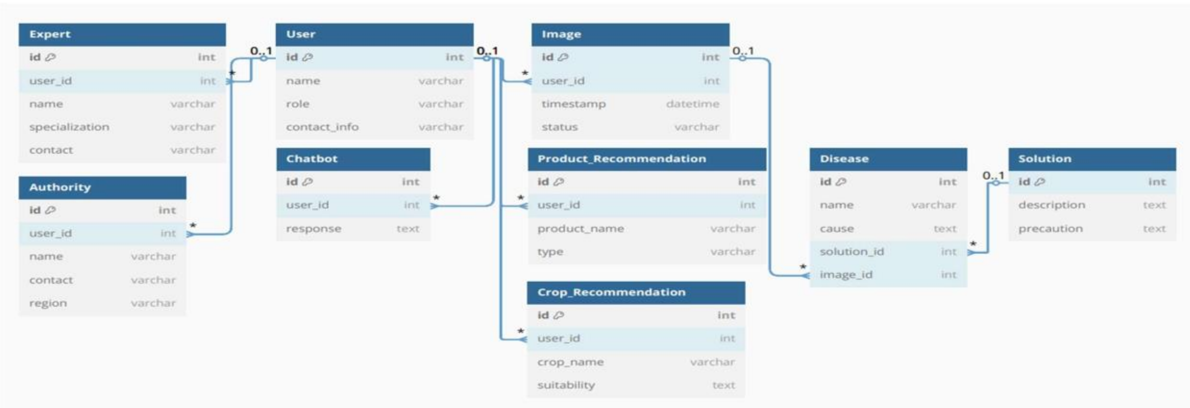

Figure 3.2 – Entity Relationship Diagram

3.5 Fundamental Model

The Fundamental Model for **Green Genie** provides a comprehensive overview of the data flow within the application, illustrating how information is processed from user input to actionable insights. This model emphasizes the interactions between various system components and outlines the steps involved in key processes.

3.5.1 Data Flow Model

Data Flow Diagram (DFD) shows graphical representation of the” flow” of data through an information system, modelling its process aspects. It includes data inputs and outputs, data stores, and the various subprocesses the data moves through. DFDs are built using standardized symbols and notation to describe various entities and their relationships.

DFD LEVEL 0

Figure 3.5 denotes the Level 0 Data Flow Diagram of the proposed system. It is also known as the Context Diagram. This is the most basic representation of the system. It shows a data system as a whole and emphasizes the way it interacts with external entities. It is a complex representation of entire system. It gives a quick idea about the data flow inside the system. The farmer interacts with the application by uploading crop images for disease diagnosis, seeking fertilizer recommendations, and receiving crop suggestions based on weather data. The Green Genie Application processes these inputs, runs algorithms to provide relevant insights, and manages the data flow efficiently. Agricultural Experts contribute by reviewing farmer queries and providing specialized advice, ensuring that the information shared is accurate and actionable.

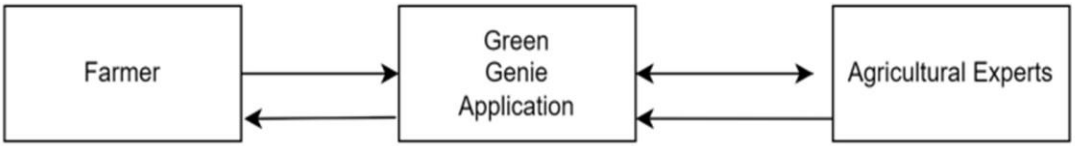

Figure 3.3 – DFD Level 0

DFD Level 1

Figure 3.6 shows the Level 1 Data Flow Diagram (DFD) of the Green Genie system, providing a more detailed view of the main processes. This level breaks down the system into several interconnected subsystems to demonstrate the flow of information more precisely. The farmer interacts with multiple modules, such as crop disease diagnosis, fertilizer recommendations, weather data, and a chatbot for agricultural queries. Each module serves specific purposes—crop disease diagnosis connects with agricultural experts for recommendations, the fertilizer module links with suppliers for input suggestions, weather data integration ensures informed crop planning. Additionally, the chatbot offers quick expert advice to address farmer queries. This breakdown into subcomponents highlights the interaction between each module, ensuring that the Green Genie application functions cohesively to enhance productivity and decision-making across various agricultural domains.

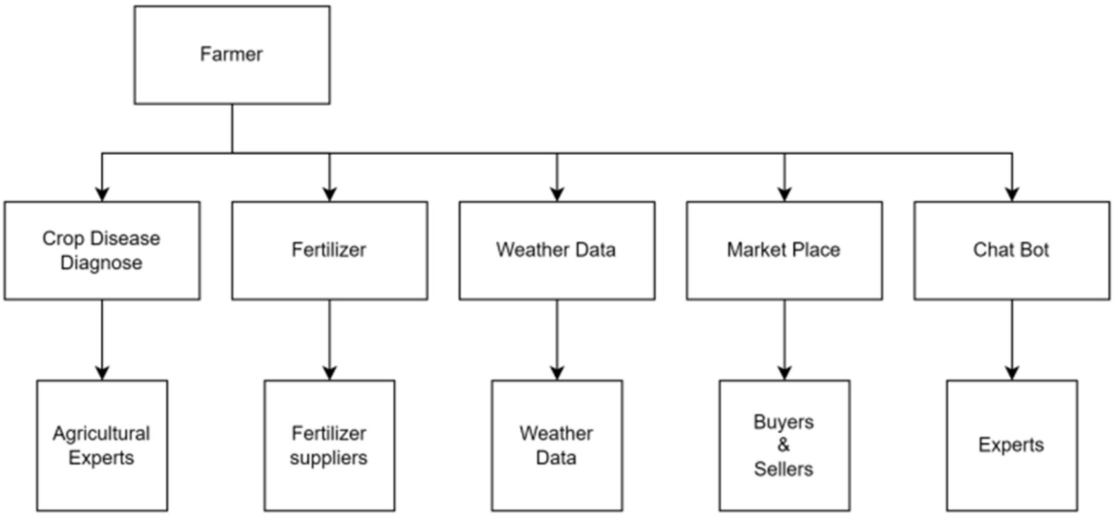

Figure 3.4 – DFD Level 1

DFD LEVEL 2

Figure 3.7 shows the Level 2 Data Flow Diagram of the proposed system. The Level 2 Data Flow Diagram (DFD) shows how the system is divided into subsystems or subprocesses. The farmer remains the same as in the Level 1 DFD, acting as the primary user. The login process is divided into forget password and reset password. Complaint filing is further divided into upload picture, update details, and contact police station. The missing people data subsystem stores information about missing people. The recognition results are linked to the missing people data to identify potential matches. Agricultural experts analyze the data and provide assistance or recommendations. Additional considerations include adding data stores, decision points, and external entities. By following these guidelines and considering the specific details of your system, you can create a comprehensive Level 2 Data Flow Diagram that accurately represents the functional decomposition.

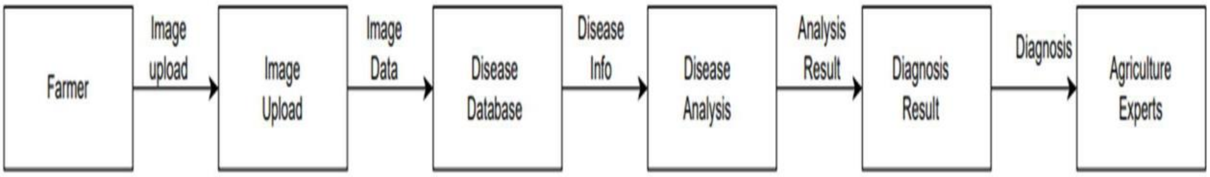

Figure 3.5 – DFD Level 2

3.6 UML (Unified Modelling Language) Diagram

The Unified Modelling Language is a general-purpose, developmental, modelling language in the field of software engineering that is intended to provide a standard way to visualize the design of a system. We have prepared and designed the UML diagrams of – Use Case, Activity, Component, Deployment and Sequence Diagrams.

3.6.1 Use Case Diagram

Figure 3.6 denotes the Use Case Diagram of the proposed system **Green Genie**. It shows the interaction of various actors with the functionalities provided by the system. The primary objective of a use case diagram in Unified Modelling Language (UML) is to visually represent how users communicate with the system to perform specific tasks. In this diagram, there are three main actors involved. The first actor is the **Farmer (User)**, the second actor is the **Expert**, and the third actor is the **Admin**. The diagram clearly outlines the different functionalities associated with each actor in the system. The farmer can authenticate, upload crop images, detect diseases using image processing, view precautionary messages, get crop recommendations, contact experts, and access marketplace features. The expert is responsible for monitoring submitted crop data, providing crop-specific recommendations, and updating disease-related information. The admin, on the other hand, manages user data, monitors uploaded content, and publishes or updates agricultural news. These interactions reflect the smart agricultural environment facilitated by machine learning and AI-driven modules. The Green Genie system bridges the gap between farmers, agricultural experts, and authorities, ensuring an integrated and intelligent support system for enhanced agricultural productivity.

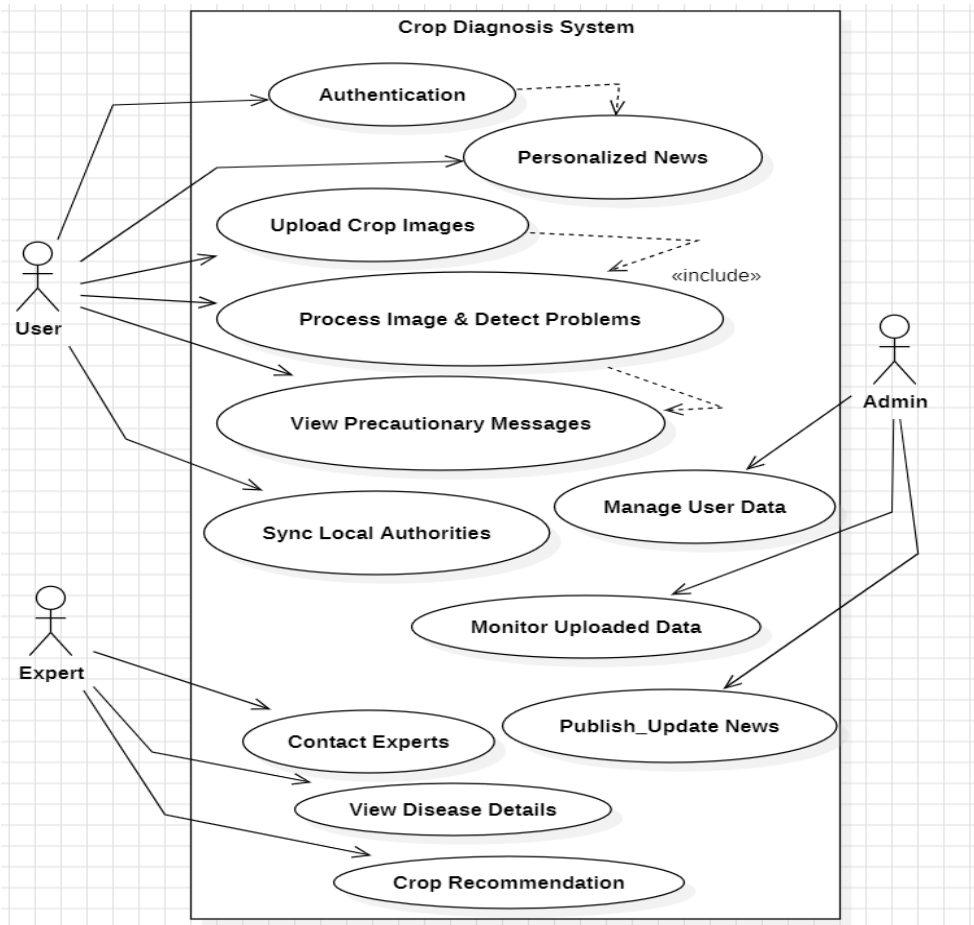

Figure 3.6 – Use Case Diagram

3.6.2 Sequence Diagram

In Figure 3.7 , we can observe the sequence diagram of the proposed Green Genie system. The key participants in this sequence include the User (farmer), various system modules like the Authentication System, ImageUploader, ImageProcessor, ProblemSolver, Message Center, Expert System, News Module, and Local Authorities. The sequence begins with the user logging into the system through the Authentication System. Upon successful authentication, the user uploads a crop image which is processed by the ImageUploader and then forwarded to the ImageProcessor. The ImageProcessor checks the image for known disease patterns. If a match is found, the ProblemSolver module sends the image for further analysis and returns the identified problem along with its solution. The system also fetches disease causes and details to assist the farmer. If no match is found, the Message Center sends a notification to the user and shares precautionary information. The system then initiates a request to contact experts through the Expert System for a more refined diagnosis. Additionally, the system provides product and crop recommendations based on the expert analysis. Throughout the process, the News Module and Local Authorities may also be contacted to fetch relevant news or updates, ensuring the farmer receives holistic support for informed decision-making.

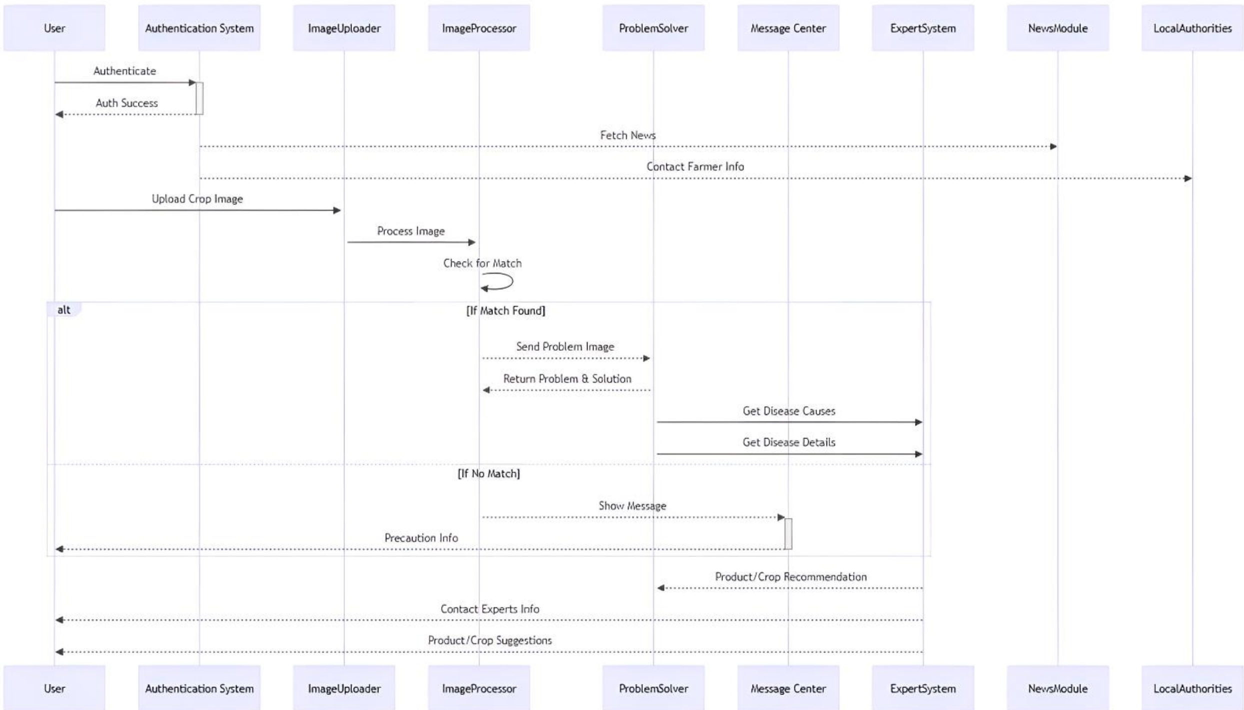

Figure 3.7 – Sequence Diagram

3.6.3 Component Diagram

In Unified Modeling Language, a component diagram illustrates how different parts of a system interact to form a complete solution. Figure 3.8 shows the component diagram of the Crop Diagnosis System, highlighting the interaction between key modules. The system is divided into four main parts: User Interaction, Processing & Detection, Recommendation System, and External Access. Users interact through modules like authentication, image upload, and expert contact. The uploaded data is processed using image analysis and problem-matching components, which reference a disease database. Based on the diagnosis, the recommendation engine suggests crops and products. External modules like local authorities and news systems enhance outreach and awareness. A central database supports seamless data flow. All components work in sync to provide accurate crop diagnostics and effective agricultural support.

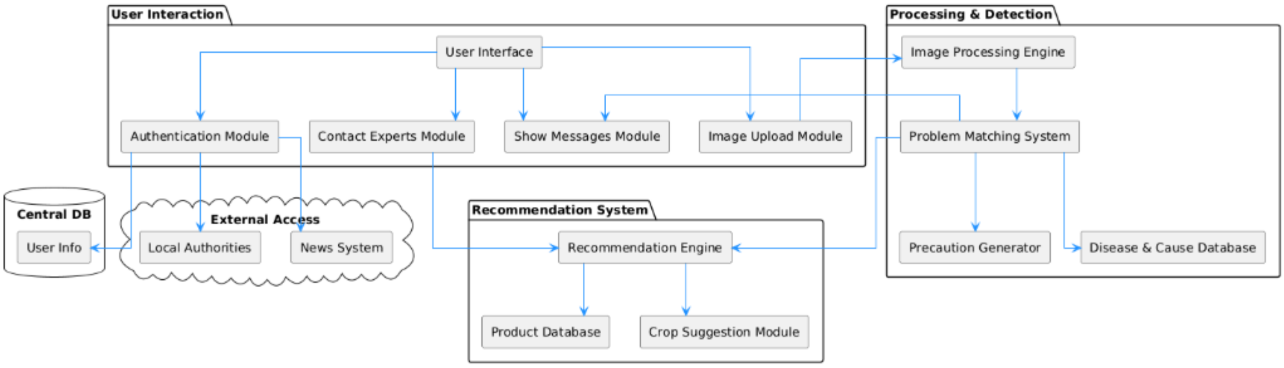

Figure 3.8 – Component Diagram

3.7 Methodology

The development of **Green Genie** follows a systematic methodology that encompasses various stages to ensure a robust, user-friendly application tailored to the needs of farmers. The methodology incorporates principles from Agile software development, allowing for iterative progress and continuous feedback.

1. Requirement Gathering and Analysis

The first phase involves gathering requirements through consultations with target users, including farmers and agricultural experts. Surveys, interviews, and focus group discussions are conducted to understand the challenges faced by farmers and the features they desire in the application.

2. Design

In the design phase, the architecture of the application is defined, including the overall system architecture, user interface design, and database schema. UML diagrams (use case, activity, sequence, component, and deployment) are created to visually represent the system’s structure and interactions, ensuring that all stakeholders have a clear understanding of how the application will function.

3. Development

The development phase involves coding the application using the chosen technology stack. The mobile app is built with a focus on user experience and interface design, employing frameworks like Flutter or React Native for cross-platform compatibility. The backend server is developed using Node.js or Django, and database management is handled through MySQL or MongoDB. Each module is developed in parallel, ensuring timely integration.

4. Testing

Testing is a crucial phase where the application undergoes various testing methods, including unit testing, integration testing, and user acceptance testing (UAT). Feedback from potential users is incorporated during this phase to identify bugs and improve functionality. The testing aims to ensure that the application performs reliably, meets user expectations, and adheres to quality standards.

5. Deployment

Once testing is complete and all feedback has been addressed, the application is deployed to production. The mobile app is published on app stores, and the backend is hosted on a cloud platform. Training materials and documentation are prepared to assist users in navigating the application.

6. Maintenance and Updates

Post-deployment, the application enters the maintenance phase, where ongoing support is provided to users. Regular updates are planned to enhance functionality, introduce new features, and address any emerging issues based on user feedback. This iterative approach allows the application to evolve and adapt to the changing needs of the agricultural community.

By employing this structured methodology, Green Genie aims to deliver a comprehensive and effective solution for farmers, enhancing their agricultural practices and promoting sustainability.

Chapter 4
Result and Discussion

This chapter includes the snapshots of the actual outputs that were seen by the user and this chapter also contains the results of the proposed system. This chapter presents the results of the Green Genie application, focusing on its performance, user feedback, and comparative analysis with existing systems. The findings underscore the effectiveness of the application in addressing the needs of farmers and enhancing their agricultural practices.'

4.1 Proposed System Result

The proposed **Green Genie** application significantly enhances agricultural management for farmers. By integrating various functionalities, it supports farmers in diagnosing crop diseases, accessing market data, and connecting with agricultural experts, ultimately streamlining their farming operations.

Figure 4.1 shows the GUI of the Home Page of the Green Genie mobile app, featuring functionalities such as disease diagnosis, and expert consultation.

Figure 4.1 – GUI of Home Page

Figure 4.2 presents the screenshot of the disease diagnosis feature, where users can capture an image of their crops and upload it for analysis.

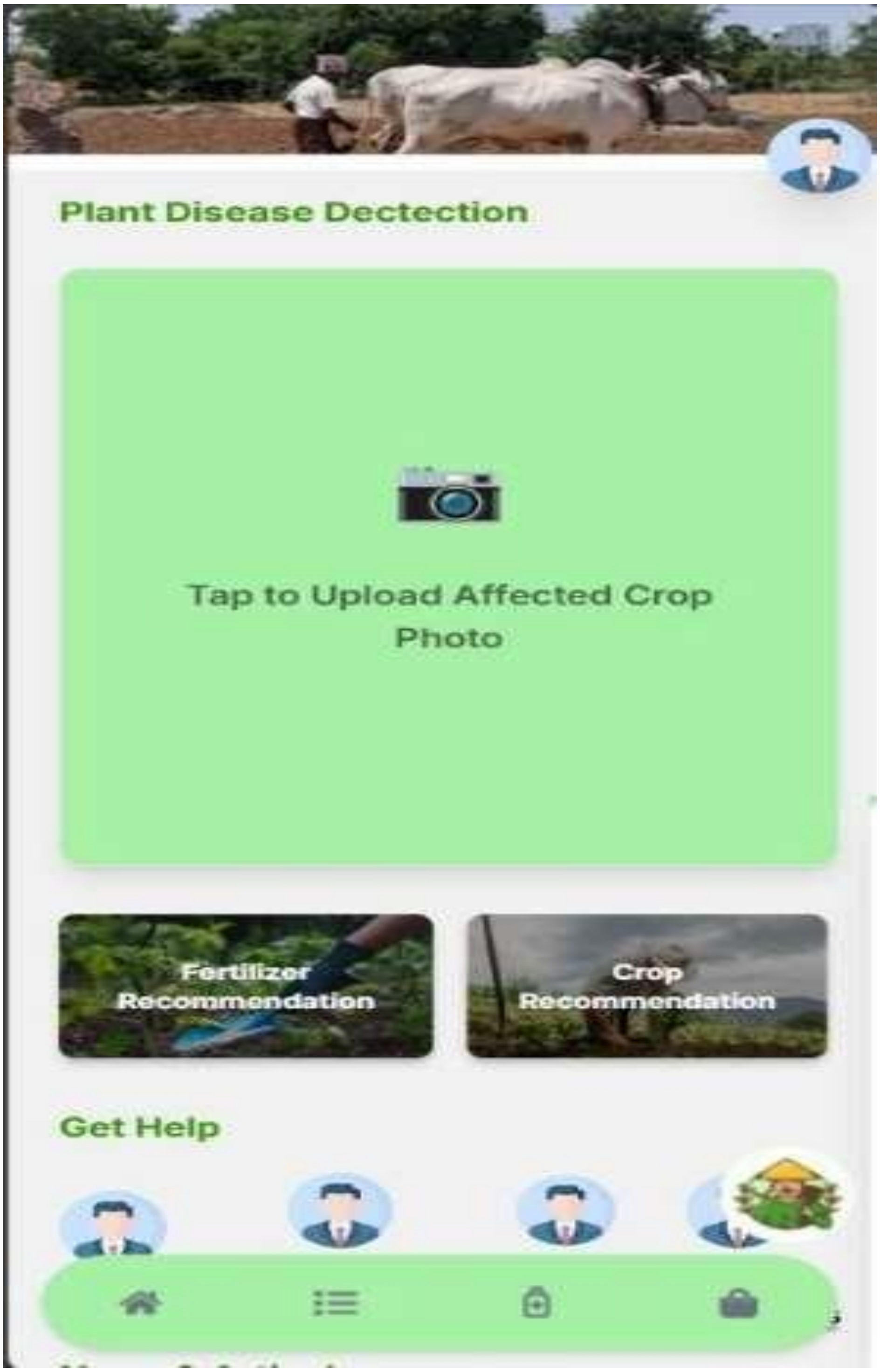

Figure 4.2 – GUI of Disease Diagnosis Page

Figure 4.3 Figure 4.3 shows the crop recommendation feature, where users input soil and environmental parameters to receive suitable crop suggestions.

Figure 4.3 – GUI of Crop Recommendation Page

Figure 4.4 displays the fertilizer recommendation feature, where users enter soil nutrient values and select a crop to receive suitable fertilizer suggestions.

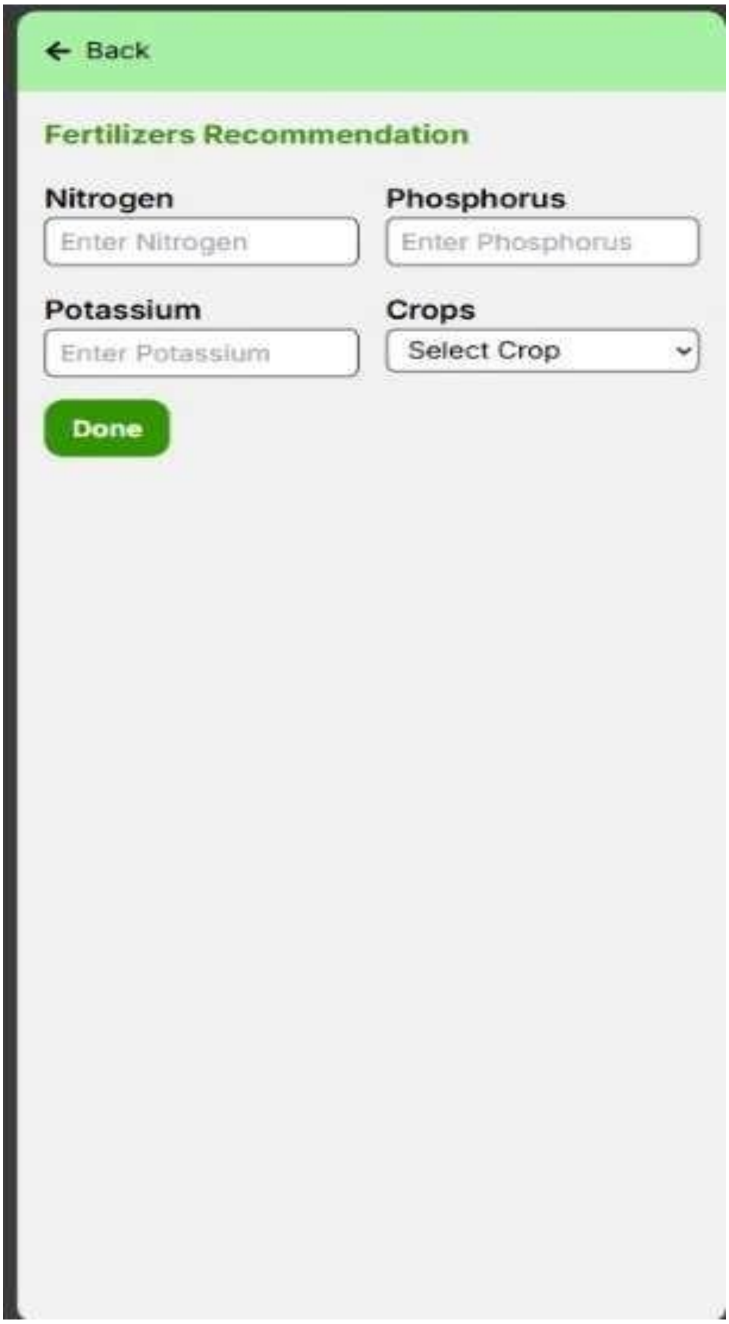

Figure 4.4 – GUI of Fertilizers Recommendation Page

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Additionally, Figure 4.5 displays the plant disease detection feature, where users upload an image of an affected crop and receive predictions about possible diseases, along with recommendations for treatment.

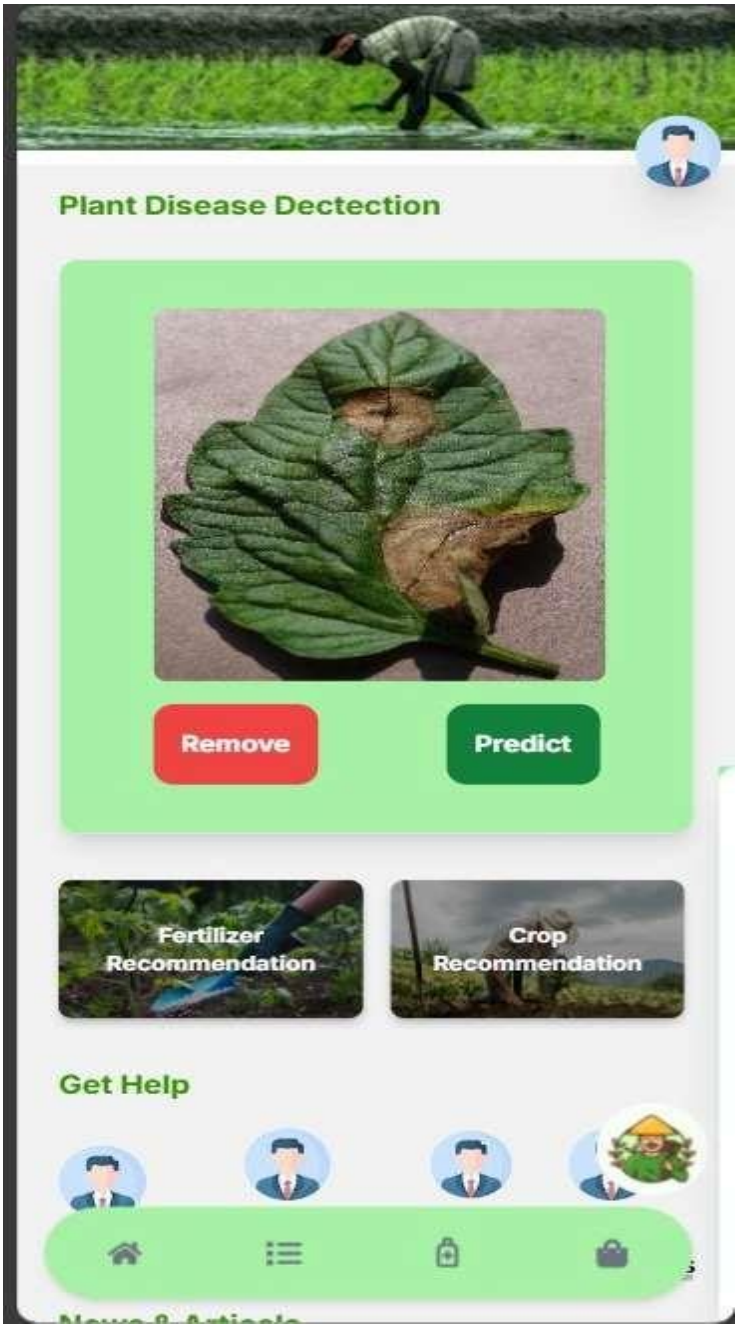

Figure 4.5 – GUI of Plant Disease Detection 2

4.2 Proposed system versus existing system

The table below outlines the key differences between existing agricultural management systems and the proposed **Green Genie** application. The parameters of differentiation include functionality, user engagement, real-time data access, accuracy, and overall impact on farming practices. This comparison serves to highlight the innovative features implemented in Green Genie.. Comparison between existing system and proposed system "Green Genie" is shown in table 4.1.

Table 4.1 – Comparison between existing and proposed system.

Parameter	**Existing System**	**Green Genie**
Functionality	Limited to basic features (e.g., market data only)	Comprehensive suite: disease diagnosis, market analysis, expert consultation, weather updates, and chatbot support
User Engagement	Low interaction, often requires manual updates	High engagement with real-time features, user- friendly interface, and interactive modules
Accuracy	Often relies on manual input; prone to errors	AI-driven analysis for accurate disease detection and personalized recommendations
Impact on Farming Practices	Minimal effect on productivity and profitability	Significant improvements in crop management, leading to higher yields and better financial outcomes
Feedback Mechanism	Limited user feedback incorporation	Continuous feedback loop allowing for ongoing enhancements based on user input
Expert Consultation	Limited to offline resources; slow response times	Immediate access to agricultural experts via the app, providing timely advice

Education and Training	Minimal educational resources available	Provides educational content and resources for farmers to enhance their skills and knowledge
Scalability	Often lacks scalability due to outdated infrastructure	Built on cloud technology, allowing for scalable solutions as user demand increases
Cost Efficiency	Higher operational costs due to manual processes	Reduces costs through automation and efficient resource management
User Support	Limited support resources; users often left to troubleshoot on their own	Comprehensive user support, including tutorials, FAQs, and a responsive helpdesk

Conclusion

The development of the Green Genie application marks a significant advancement in agricultural management, offering farmers a comprehensive toolset designed to address their unique challenges. Through its integrated functionalities, including AI-powered disease diagnosis, real-time market analysis, expert consultation, and educational resources, Green Genie empowers farmers to make informed decisions, optimize their operations, and ultimately enhance productivity and profitability. The comparative analysis with existing systems reveals that Green Genie outperforms traditional agricultural management tools in multiple aspects, including functionality, user engagement, and real-time data access. By providing a user- friendly interface and incorporating advanced technologies, the application not only improves the accuracy of disease detection but also facilitates timely access to market information, enabling farmers to respond swiftly to changing conditions. Moreover, the continuous feedback mechanism ensures that the application evolves with user needs, allowing for ongoing improvements and adaptations in a dynamic agricultural landscape. In summary, Green Genie is poised to revolutionize the way farmers manage their agricultural practices. By leveraging technology to bridge the gap between traditional farming methods and modern agricultural techniques, the application serves as a vital resource for farmers seeking to navigate the complexities of contemporary agriculture. The positive outcomes observed during testing underscore the potential impact of Green Genie in promoting sustainable farming practices and improving the livelihoods of farmers.

Appendix

1. **Draw.io**

Description: Online diagramming tool for creating UML diagrams.
Usage: Used for designing Data Flow Diagrams, Use Case Diagrams, and Entity Relationship Diagrams.

2. **OpenCV**

Description: Open-source computer vision library.
Usage: Employed for real-time image processing and analysis of crop health.

3. **Firebase**

Description: Platform developed by Google for mobile and web applications.
Usage: Provides backend services, including real-time database management, user authentication, and cloud storage.

4. **Vite**

Description: A fast build tool and development server for modern web projects, particularly focused on performance optimization for front-end frameworks like Vue.js, React, and others.
Usage: Utilized for quickly building and serving the web-based version of the app, with hot module replacement (HMR) to improve developer experience during front-end development.

5. **Flask/Django**

Description: Web frameworks for Python.
Usage: Used for developing the backend server, handling requests, and managing APIs.

6. **Git**

Description: Version control system.
Usage: Employed for tracking changes in the codebase and collaborating with team members.

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