SMART AGRICULTURE SUPPORT SYSTEM FOR ALOEVERA

Project ID: 2025-26J-166

Project Proposal Report

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DECLARATION

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We declare that this is our own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Date

ABSTRACT

Aloe Vera is increasingly cultivated in Sri Lanka for its medicinal and economic value, but farmers face significant challenges due to diseases that affect both yield and quality. Early detection and accurate diagnosis are often difficult because farmers rely on traditional observation methods, which can be subjective and inconsistent. This research component focuses on developing an intelligent disease detection system that combines leaf image analysis with farmer-reported symptoms to improve accuracy and usability. A comprehensive database of Aloe Vera leaf images covering both healthy and diseased samples will be built alongside farmer's provided symptom records from diverse regions. Using Convolutional Neural Networks (CNN), the system will analyze visible patterns such as color changes, spots, and rotting, while Natural Language Processing (NLP) will process farmer inputs in Sinhala, Tamil, or English through text or voice. By cross-referencing visual findings with farmer symptom descriptions, the system provides a more reliable diagnosis. Real-time feedback will deliver disease names and step-by-step treatment guidance in the farmer's preferred language, enhanced with icons and simplified terms for accessibility. Additionally, the system will track treatment outcomes through farmer's daily reports, enabling continuously improvement of disease models and that expand the knowledge base with agricultural experts inputs. This approach not only empowers farmers with actionable insights but also contributes to a sustainable, data driven framework for smart Aloe Vera cultivation in Sri Lanka.

TABLE OF CONTENTS

List of Figures

List of Tables

1.INTRODUCTION

Aloe Vera farming has become an important economic activity in Sri Lanka, especially for rural communities looking for alternative income sources. The country exported 2,080 metric tons of Aloe Vera products in 2022, earning USD 15.06 million. However, many farmers still struggle with basic problems that reduce their profits and crop quality. After talking to farmers in areas like Lunugamwehera, Kalpitiya and Rajanganaya, it becomes clear that disease management is one of their biggest challenges.

The problem is simple but serious. When farmers notice their Aloe Vera plants getting sick, they often don't know what disease it is or how to treat it. Most farmers in rural Sri Lanka cannot easily access agricultural officers or plant disease experts . By the time they get help, the disease has usually spread to many plants, causing significant losses. Common diseases like bacterial soft rot and leaf spots can destroy entire plantations if not caught early.

Current solutions are not working well for ordinary farmers. Existing plant disease detection apps mostly work only in English and need clear, perfect photos to function properly. This creates problems for Sri Lankan farmers who speaks Sinhala or Tamil and may not be align and comfortable with technology. Many farmers also work in fields where taking perfect photos is difficult due to poor lighting or weather conditions also they have some technical issues as well.

What makes the situation worse is that farmers often cannot explain their plant problems properly when they do get help. They might say their plants are "leaves turning yellow" or "getting spots in leaves" but these descriptions in local languages don't always translate well to technical disease identification. Agricultural extension services, when available, are usually provided in formal language that farmers sometimes find hard to understand.

Modern technology offers new possibilities to solve these problems. Recent advances in artificial intelligence, particularly Convolutional Neural Networks (CNNs), have shown remarkable success in identifying plant diseases from photos. Some systems can achieve over 98% accuracy in controlled conditions. Additionally, voice recognition technology has become much better at understanding different languages and dialects, making it possible for farmers to interact with apps using their own words.

However, most existing plant disease detection systems have significant limitations for real-world use. They typically rely only on image analysis, which fails when photos are unclear or unavailable. They also don't take advantage of the detailed symptom descriptions that farmers can provide. For example, a farmer might notice that leaves are soft and smelly (indicating bacterial rot) or that spots appear during rainy weather, but current systems ignore this valuable information.

This research project aims to create a comprehensive disease detection system specifically for Aloe Vera farmers in Sri Lanka. Unlike existing solutions, this system will combine image analysis with natural language processing to understand farmer descriptions in Sinhala, Tamil, and English. The system will work through voice input, making it accessible to farmers regardless of their literacy levels or technical skills.

The significance of this work goes beyond just technology. Sri Lanka's agricultural sector employs millions of people, and crops like Aloe Vera represent important opportunities for economic development. By making disease detection more accessible and accurate, this system could help farmers reduce crop losses, improve product quality, and increase their incomes. The system's focus on local languages and farmer-friendly interfaces addresses a real gap in agricultural technology adoption in developing countries like Sri Lanka.

Aloe Vera farming in Sri Lanka is also influenced by the country’s climate and land issues. It grows best in semi-arid regions like Lunugamwehera Puttalam, Kalpitiya, and parts of the Northern Province where rainfall is low and soil conditions suit the plant. However, expanding

Aloe Vera cultivation on a large scale of faces hurdles such as land use conflicts and environmental concerns. For example, some large projects in the Anuradhapura district have come under scrutiny for operating near protected forest areas and wildlife buffer zones, leading to protests and legal challenges by environmental groups. These issues highlight the delicate balance between agricultural development and environmental sustainability.

Despite this, small-scale farmers see Aloe Vera as a promising crop for diversifying income, especially in coastal and dry zones where traditional crops fail due to poor soils and water scarcity. Aloe Vera's low water needs and medicinal value make it attractive, but farmers continue to struggle with pest and disease control, lack of proper farming knowledge, and limited access to affordable technology. This reinforces the need for easy-to-use, practical tools that support farmers in managing their crops more effectively without requiring advanced skills or expensive equipment.

Figure 1.1: Leaf Spot

Figure 2.2: Aloe Rust

Figure 1.4: Bacterial Soft Rot

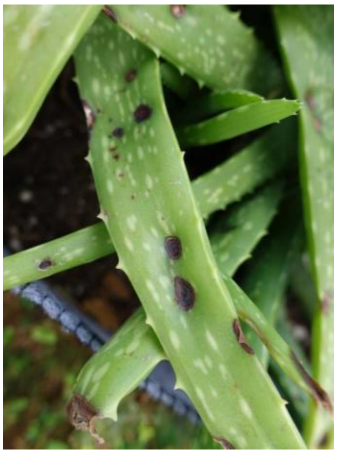


Figure 1.3 : Anthracnose

1.1 Background and Literature Review

Aloe Vera cultivation in Sri Lanka has been steadily gaining attention over the last decade. The plant, known locally as "Komarika," is valued both as a traditional household remedy and as a commercial crop with applications in medicine, cosmetics, and the food industry. Farmers across the dry and intermediate zones such as Lunuamwehera ,Thissamaharama ,Kalpitiya, Rajanganaya have shown increasing interest in Aloe Vera because it is relatively low maintenance and capable of producing a fix income if managed them properly [6]. However, as with many agricultural crops, diseases remain one of the most serious challenges affecting productivity and farmer livelihoods.

A preliminary survey conducted for this research revealed some important insights about the current situation of Aloe Vera disease management in Sri Lanka. When we asked asked "Can you identify Aloe Vera disease correctly?", only 15% of farmers responded as answer 'Yes', while a 85% admitted they could not identified correctly (Figure 5) This highlights a high knowledge gap in disease recognition at the farmer level , farmers often apply treatments incorrectly or fail to act until the disease has caused significant damage to their crops.

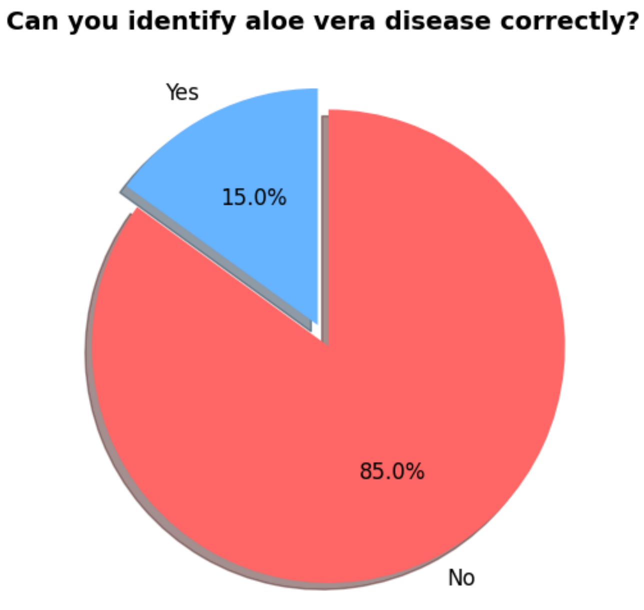


Figure 5: Survey to identify the people's choice regarding disease identification

The second survey question focused on crop losses: “Have you ever faced severe yield loss due to Aloe Vera diseases?”. Here, 68% of respondents said ‘Yes’, while only 32% reported ‘No’ (Figure 6). This demonstrates that disease outbreaks are not just minor inconveniences but are actively reducing harvests and threatening the profitability of Aloe Vera cultivation. Such figures emphasize the urgent need for better tools and approaches to support disease management.

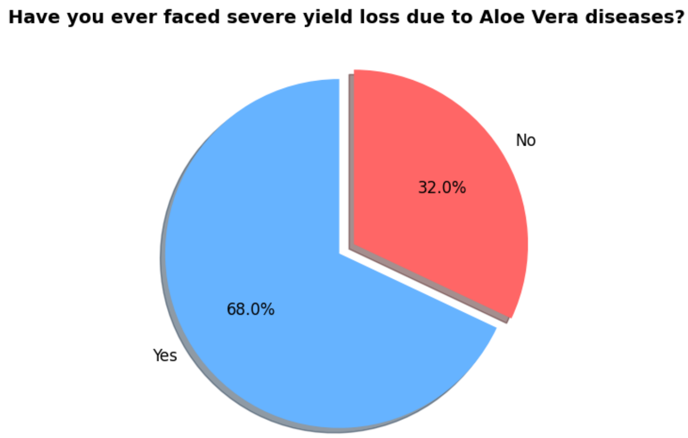


Figure 6: Survey to identify the people’s choice regarding yield loss due to diseases

Finally, the survey explored technology adoption with the question like “Would you be interested in using a mobile app that can detect Aloe Vera diseases using leaf images and your descriptions?”. So, the response was overwhelmingly positive, with 91% answering ‘Yes’ and only 9% saying ‘No’ (Figure 7). This can finding suggests that most of farmers are like to open to digital solutions, provided that these solutions are user friendly, available in their local language, and practically useful in the field.

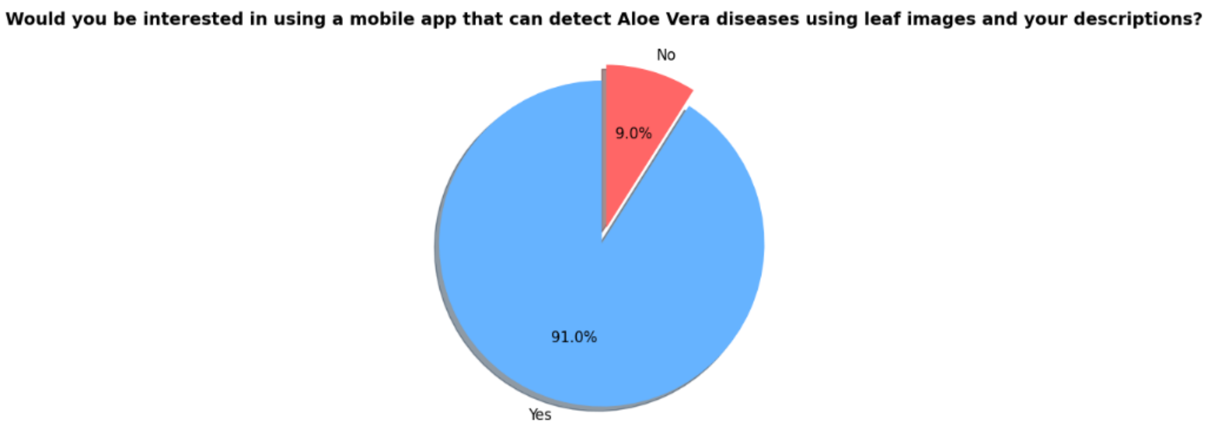


Figure 7:Survey to identify the people’s choice regarding interest about mobile app

When considering specific diseases, four major threats to Aloe Vera crops in Sri Lanka have been identified they are Leaf Spot(figure 1.1), Aloe Rust (figure 1.2), Bacterial Soft Rot (figure 1.3), and Anthracnose (figure 1.4). Because of each of these farmers face many challenges.

Several studies have shown the global importance of detecting and managing plant diseases using advanced technologies.Many researchers are explored image processing techniques and machine learning algorithms[3], particularly Convolutional Neural Networks (CNN), to classify crop diseases with high accuracy. For an example, in other agricultural contexts, YOLO (You Only Look Once) models and deep learning techniques have been successfully applied to detect pests and diseases across crops like plants and . These approaches provide inspiration for applying similar models to Aloe Vera diseases. In Sri Lanka, however, there is very limited research specifically addressing Aloe Vera disease detection using precision agriculture techniques.

The gap is clear for he farmers lack accessible and reliable tools for identifying and managing Aloe Vera diseases. Current practices rely heavily on manual observation, which is often not accurate, time-consuming, and dependent on farmer experience. This explains why most responds in our survey cannot correctly identify Aloe Vera diseases. [2] Additionally, the lack of correct well structured databases for Aloe Vera disease symptoms in Sri Lanka makes it harder for that related officers and researchers to provide timely guidance.

By addressing this problem closely, a digital system that combines leaf image analysis with farmer reported things llike symptoms could transform how Aloe Vera diseases are detected and after treat correctly. Not only would such a system encourage farmers to take early action and reduce to their yield losses, but it would also help researchers and policymakers track disease trends at a national scale. Moreover, since many farmers expressed interest in using a mobile app, there is strong potential for successful adoption of this technology in rural communities.

In conclusion, while Aloe Vera holds great promise as a commercial crop in Sri Lanka, its cultivation is hindered by common diseases such as Leaf Spot, Aloe Rust, Bacterial Soft Rot, and Anthracnose. Farmers currently face major barriers in recognizing and managing these diseases, as reflected in the survey results. Literature shows that advanced image-based detection methods can overcome similar challenges in other crops, but little work has been done on Aloe Vera specifically. Therefore, this study aims to bridge that gap by developing a smart agriculture support system that combines image recognition and natural language symptom analysis to improve disease detection and treatment in Aloe Vera cultivation.

1.2 Research Gap

Aloe Vera is a widely used medicinal plant grown in Sri Lanka, having cosmetic, pharmaceutical, and health importance. Thus, farmers face serious issues induced by diseases such as rust, leaf spot, basal stem rot, and bacterial soft rot. Such diseases have the ability to spread quickly and that may reduce crop yield and quality of the aloe vera. Even though most of the research has been focused on the general detection of diseases in crops using image processing and machine learning, Aloe Vera has received very little direct attention.

Most of the current research is dedicated to disease recognition in other crops such as rice, coconut, or vegetables. Some research utilized convolutional neural networks (CNNs) for classifying crop leaf diseases with high accuracy, and some used image processing for detecting pest attacks or nutritional deficiency. These approaches show the results, but they are not specific to Aloe Vera and do not consider Aloe Vera's specific disease patterns, leaf structure, or good farmer practices in Sri Lanka.

One of the main limitations is that most systems rely exclusively on image data. Real-world farmers do not always capture perfect images of diseased leaves. More often, farmers describe symptoms in terms such as "the leaf has yellow spots" or "the base is rotting." Unfortunately, very few systems utilize both visual data (leaf images) and farmer-reported symptoms to improve disease diagnosis. That creates a certain gap because rural farmers mostly use Sinhala or Tamil as their mother tongue, and a system that is able to understand their language inputs would be far more practical.

Table 1:Comparison between existing systems

Application Reference	Disease Identification	Aloe Vera Specific	Symptom based Input	Image + Symptom Matching	Treatment Recommendation
Research A	✓	X	X	X	X
Research B	X	X	X	X	X
Research C	X	X	X	X	X
Research D	X	X	X	X	X
Proposed System	✓	✓	✓	✓	✓

Research Paper [1] mainly talks about the medicinal and health values of Aloe Vera. It explains how Aloe Vera is used for skincare, wound healing, and digestion-related treatments. But the problem here is, even though it highlights the benefits of Aloe Vera, it does not discuss about the agricultural side or the plant diseases which affect Aloe Vera leaves in Sri Lanka. Our project is different because we are focusing on how to protect the plant before it even goes into production.

Research Paper [3] is more related to our area. It studies leaf spot disease in Aloe Vera and gives solutions using chemicals and plant extracts. The paper is very helpful to know the treatment side of one particular disease. But the weakness is, it only covers one disease and the focus is on laboratory/chemical solutions. In the real world, farmers in rural Sri Lanka cannot always identify which disease it is and don't have access to correct chemicals. That's where our system comes to fill the gap by first detecting diseases using leaf images + symptoms and then recommending treatments.

Research Paper [6] (*Auto Training an AI for Detecting Plant Disease Using Twitter Data Annexed With a Plant Anthology, 2021 December*) uses AI and social media data for detecting plant diseases. This is close to our component because it also uses artificial intelligence. But the drawback is it mainly focuses on general plant diseases (not Aloe Vera specifically) and it depends on Twitter text data, not real farmer inputs or images. Farmers in Sri Lanka usually don't use Twitter; they explain their problems in Sinhala or Tamil. So our work is filling the gap by making a farmer-friendly mobile tool that uses voice/text in local languages and combines it with image recognition.

Research Paper [2] looks at how Aloe Vera can be processed into value-added products like gels, juices, or cosmetics. It's more about business and marketing side of Aloe Vera. The gap here is that if diseases destroy the leaves, there will be nothing to process. This shows that before thinking about Aloe Vera products, the farmer should be able to identify and manage plant diseases properly. Our proposed system fits before this step, to support farmers at the root level.

1.3 Research Problem

Aloe Vera is a widely cultivated medicinal and cosmetic plant in Sri Lanka due to its high demand in both local and international markets. However, farmers face critical challenges in maintaining healthy crops and achieving profitable yields. Diseases such as leaf spot (*Alternaria alternata*), basal rot (*Fusarium spp.*), rust (*Phakopsora pachyrhizi*), and bacterial soft rot are common in Aloe Vera plantations. These diseases often go unnoticed in their early stages because farmers primarily rely on manual inspection with the naked eye. Such traditional methods are time-consuming, less accurate, and often fail to detect infections at an early stage, leading to reduced plant health, low yield, and economic loss.

Another challenge is the lack of a centralized Aloe Vera disease database that documents leaf symptoms, farmer-reported issues, and effective treatments. Most rural farmers depend on local knowledge or trial-and-error methods, which can be misleading and may worsen plant conditions. Due to limited communication between farmers and agricultural experts, many small-scale Aloe Vera cultivators are left without timely guidance.

Moreover, farmers struggle to describe symptoms effectively, especially in rural areas where Sinhala and Tamil are the primary languages. Without tools that support multi-language symptom reporting (text or voice), the gap between farmers and expert knowledge widens, making disease diagnosis harder.

In addition, although weather conditions, soil nutrients, and climate variability play a key role in Aloe Vera yield and quality, farmers lack intelligent tools that can recommend planting strategies, predict yields, and forecast market price trends. Without these predictive insights, Aloe Vera cultivation remains risky and less profitable.

A survey was conducted among Aloe Vera farmers to understand the situation.

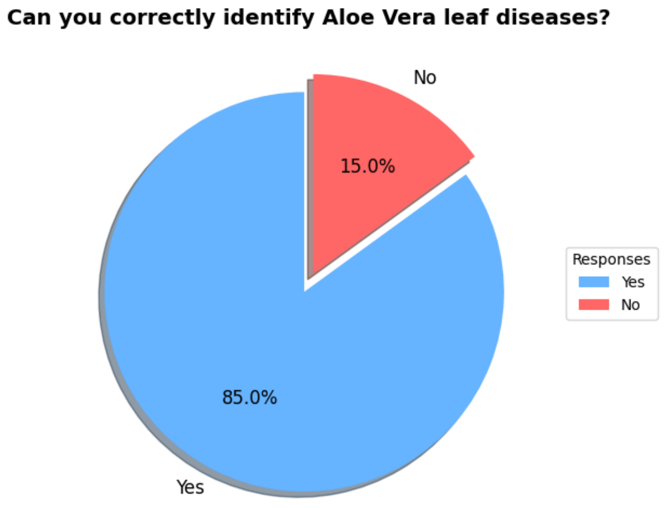


Figure 8 :Can farmers correctly identify Aloe Vera leaf diseases?

As shown in the figure, only 15% of farmers said Yes, while a big 85% said No. This means majority of Aloe Vera farmers cannot identify the leaf diseases correctly. This lack of knowledge causes late treatments and sometimes even crop failures.

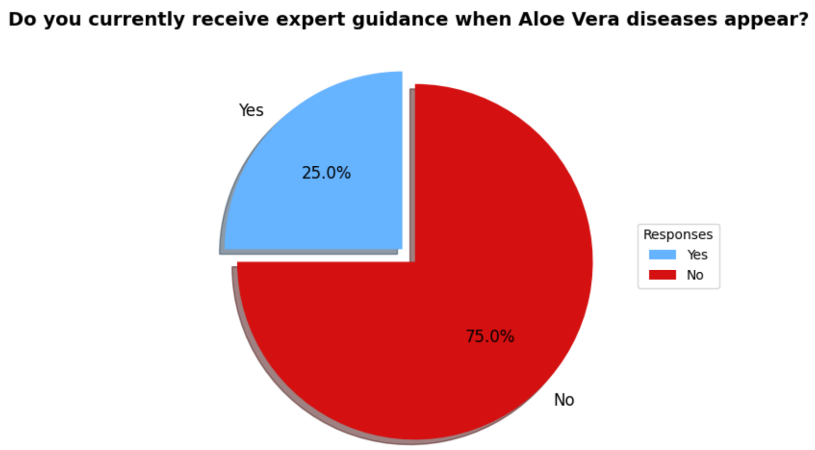


Figure 9:Farmers currently receive expert guidance when Aloe Vera diseases appear?

According to this survey, only 25% farmers said Yes, they are getting expert guidance, and 75% said No. This shows that most of the farmers are struggling without any direct help from agriculture officers or experts. Because of this, many farmers are depending on local traditional methods which are not always correct.

Therefore, there is an urgent need to develop a Smart Agriculture Support System for Aloe Vera that integrates Convolutional Neural Networks (CNN) for disease detection using leaf images, Natural Language Processing (NLP) for farmer symptom reporting, yield prediction models using soil and climate data, and market trend forecasting using ARIMA/LSTM models. Such a solution would empower Aloe Vera farmers in Sri Lanka to increase yield, improve disease management, and maximize profits while contributing to sustainable agricultural practices.

2.OBJECTIVES

2.1 Main Objectives

The main objective of this study is to identify Aloe Vera diseases at an early stage and determine the severity of the infection. Based on the severity, the system will recommend appropriate control and treatment measures. Through a reliable and user-friendly cross-platform application, users will be able to capture or upload images of infected Aloe Vera leaves to detect the disease and take corrective actions quickly.

2.2 Specific Objectives

Three specific objectives must be reached to achieve the overall objective described below.

Identification of the Aloe Vera disease

When a user uploads an image of an Aloe Vera leaf, it will be analyzed by the model. If the model successfully detects signs of disease, the image will pass to the disease classification stage. If the system fails to detect a disease, it will notify the user and request a new image.

Identification of the specific disease type

After detection, the model will classify the correct type of Aloe Vera disease. Common diseases include leaf spot disease, aloe rust, bacterial soft rot, and basal stem rot. By identifying the exact disease, the system can recommend precise treatments. If the disease does not match any known category, the system will suggest general preventive measures to the user.

Identification of the severity of the disease

Determining the infection level is crucial for minimizing crop loss. If the disease is identified at an early stage, farmers can apply preventive measures such as fungicides, improved watering methods, or pruning infected parts. If left untreated, the disease can spread rapidly, damaging Aloe Vera leaves and reducing plant quality, which directly affects the farmer's market income. Therefore, identifying the severity of the infection is critical to ensure better decision-making.

3. METHODOLOGY

The proposed smart system for Aloe Vera aims to detect diseases using leaf images and farmer-reported symptoms, providing timely guidance to improve crop health and yield. The methodology follows a structured process to ensure accurate detection and actionable recommendations.

3.1 System Architecture

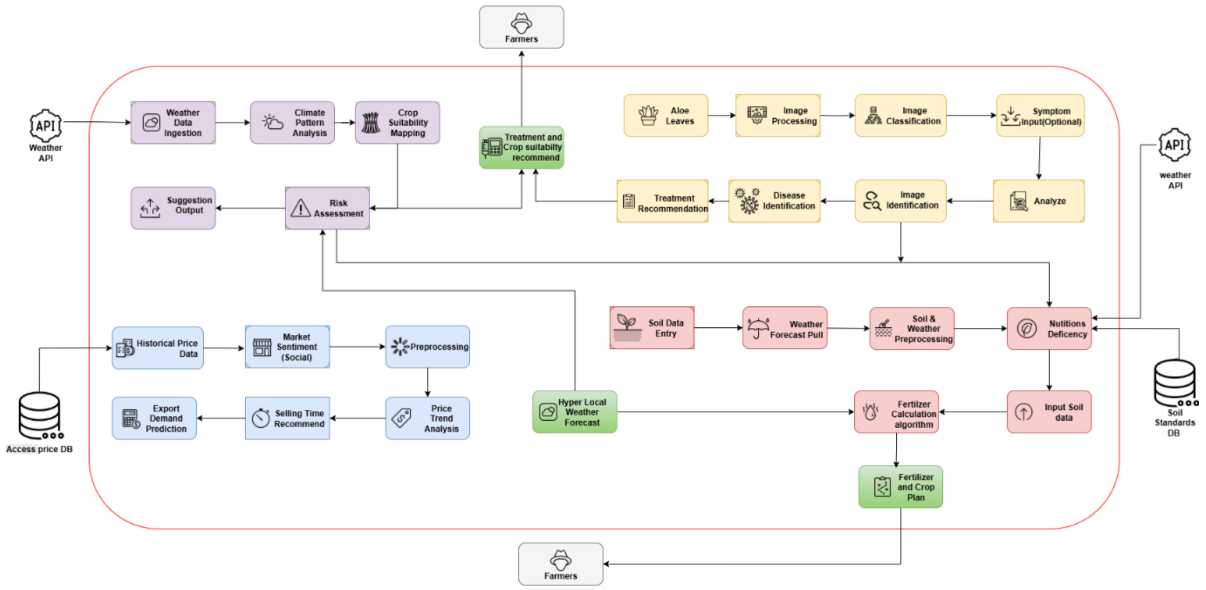


Figure 10: Overall system diagram

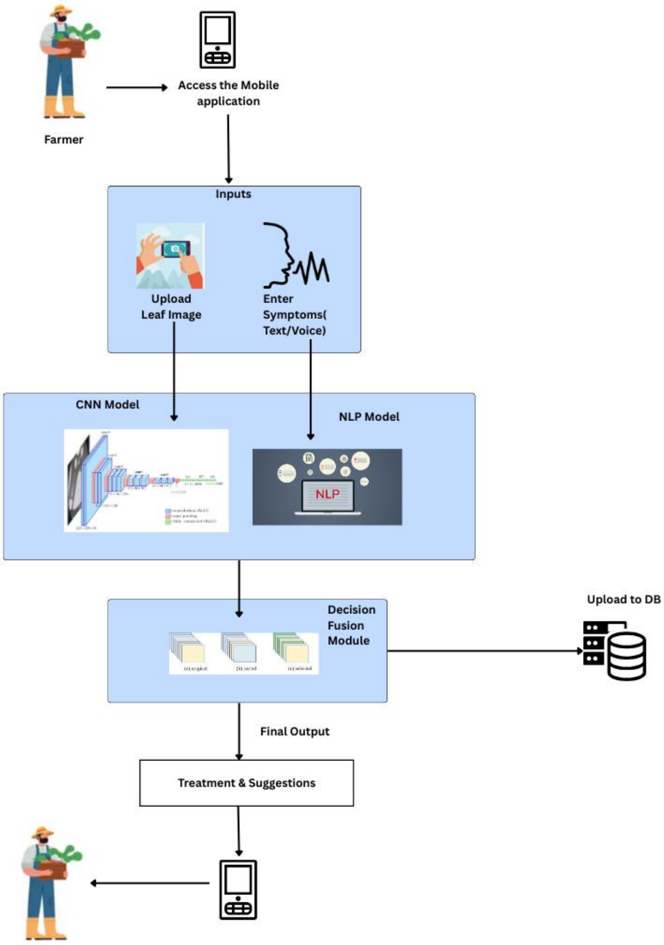


Figure 11:Component Diagram

Figure 10 illustrates the overall high-level diagram of the proposed Aloe Vera disease detection component. Initially, the farmer accesses the mobile application. The farmer is provided with an option to either capture a new leaf image or upload an existing image of the Aloe Vera plant using a cross-platform mobile application developed with React Native.

The captured or uploaded image is preprocessed and then converted into a Base64 stream before being sent to the Flask server via the mobile app. The server applies machine learning and image processing techniques to analyze the leaf for visible disease symptoms.

In addition to image analysis, the farmer can also input symptoms through text or voice in Sinhala, Tamil, or English. The text input is preprocessed and passed through an NLP model to extract structured symptom information.

The system has three main subcomponents, as shown in Figure 11

After detection and classification, the system delivers treatment guidance and recommendations, which include step-by-step instructions and preventive measures. Farmers can also provide post-treatment feedback, enabling the system to continuously update the disease database and improve future diagnosis accuracy.

Table 2:Technologies, techniques, architectures, and algorithms used.

Technologies	Python, TensorFlow, Keras, React Native, Flask Server, VS Code
Techniques	Machine Learning, Deep Learning, Image Processing, NLP, Data Augmentation
Algorithms	Convolutional Neural Networks (CNN), YOLO (You Only Look Once
Architectures	CNN Architectures (for Leaf Disease Detection), YOLO v5, Inception v4

3.1.1 Software solution

The Software Development Life Cycle (SDLC) is a structured process that development teams follow to design, build, and test high-quality software. By carefully planning each stage, SDLC helps minimize risks and ensures that the final product meets user expectations. Traditional development approaches require completing each step sequentially, with little flexibility to revisit previous stages. To address this limitation, many teams adopt the Agile methodology, which allows developers to respond to changes more effectively. Among Agile frameworks, Scrum is the most widely used, offering a lightweight and flexible approach that helps teams collaborate efficiently and deliver incremental improvements.

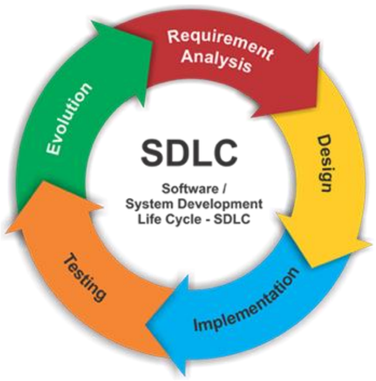


Figure 12:SDLC

• **Requirement gathering**

o **Data gathering**

For data gathering, our team visited ‘VAC Farm in Thissamaharama. The farmers record data using manual methods and we will be able to collect soft copies of that dataset later. Furthermore, we had to collect data manually by visiting the farm.

o **Conducting a survey**

We conducted a survey by providing a questionnaire to get a proper idea about what people know about Aloe Vera diseases

• Feasibility Study (Planning)

Economic Feasibility

The proposed subcomponent should function reliably without errors or failures. It is designed to be cost-effective while delivering accurate and consistent results. Ensuring low operational costs and high efficiency makes it economically viable for the project.

o Schedule Feasibility

This subcomponent plays a crucial role in the overall project, and it must be completed within the allocated timeline. It should perform efficiently, contributing to achieving the project objectives on time. Meeting deadlines ensures that the system can be delivered and deployed without delays.

3.2 Research Constraints

3.2.1 Data Availability and Quality

- Access to comprehensive datasets for Aloe Vera diseases, including leaf images, farmer-reported symptoms, and environmental conditions, may be limited in Sri Lanka.
- Collected data may contain inconsistencies, mislabeled images, or missing information, which can reduce the accuracy of disease detection models.

3.2.2 IT Device Limitations

- Deployment of mobile-based detection tools in rural Aloe Vera farms may face challenges such as low-end smartphones, battery limitations, and unreliable network connectivity.
- Farmers' devices may not capture high-resolution images consistently, affecting the performance of the CNN and NLP models.

3.2.3 Model Generalization

- Models trained on limited or region-specific Aloe Vera data may not perform well for other varieties, soil types, or climatic conditions.
- Seasonal changes, extreme weather events, or sudden disease outbreaks may reduce the accuracy of disease detection and severity assessment.

3.2.4 Infrastructure and Resource Constraints

- Limited computational resources in rural areas may restrict real-time processing of leaf images and symptom data.
- Internet connectivity issues could affect communication between the mobile app, backend server, and disease detection system, delaying feedback to farmers.

3.2.5 Time Constraints

- The research timeline limits extensive model fine-tuning, testing across multiple Aloe Vera farms, and exploration of advanced image preprocessing techniques.
- Manual labeling of leaf images and symptom data is time-consuming, restricting the size and diversity of the training dataset.

4. PROJECT REQUIREMENTS

4.1 Functional Requirements

1. **Data Acquisition**
    - The system should allow farmers to capture real-time Aloe Vera leaf images and provide symptom descriptions (text or voice).
    - It should allow the farmer to input environmental parameters such as soil pH, moisture, temperature, and sunlight exposure to help improve disease diagnosis and severity estimation.
2. **Data Input and Management**
    - The system should securely store historical leaf images, farmer symptom reports, and environmental data for model training, inference, and traceability.
    - Farmers should be able to retrieve previous records to track disease progression and treatment outcomes.
3. **Disease Detection & Severity Analysis**
    - The system should identify Aloe Vera diseases (Leaf Spot, Aloe Rust, Bacterial Soft Rot, Anthracnose) from leaf images and symptoms.
    - It should estimate the severity of the infection (mild, moderate, severe) to help farmers take timely action.
4. **Treatment Recommendations**
    - Based on the disease type and severity, the system should provide actionable suggestions, such as chemical, organic, or cultural control methods.
    - The system should also include post-treatment monitoring reminders to ensure successful recovery.
5. **User Interface**
    - The system should have a farmer-friendly mobile dashboard that displays detected diseases, severity levels, and suggested treatments in simple language with visuals.

- Farmers should be able to trigger disease detection, record symptoms, and upload images on demand.

6. **Notifications & Alerts**
   - The system should notify farmers of sudden environmental changes (e.g., high humidity, heavy rainfall) that could worsen disease spread.
   - It should provide reminders for follow-up inspections, treatment application, and monitoring of Aloe Vera crops.

4.2 Non-Functional Requirements

1. **Performance**
   - The system should detect diseases and provide treatment recommendations within a few seconds of image submission.
   - It should handle multiple simultaneous users without significant delays.
2. **Security**
   - Farmers' data, including images and symptom reports, should be stored securely and only accessible by authorized users.
   - Data privacy should be maintained, and sensitive information should be encrypted.
3. **Usability**
   - The mobile application should be intuitive, requiring minimal training.
   - Disease detection results, severity, and treatment advice should be presented clearly in charts, tables, or simple text.
4. **Reliability**
   - The system should consistently provide accurate disease detection and severity results.
   - Error handling should manage incomplete or unclear symptom reports and poor-quality images.

5. **Maintainability**
    - The system should be modular so updates to the disease detection models, database, or recommendation engine can be implemented without downtime.
    - It should allow for easy retraining of models as new Aloe Vera disease data becomes available.
6. **Efficiency**
    - The system should process leaf images and symptom data quickly.
    - It should be optimized for low-end devices to ensure smooth performance for farmers in rural areas.

4.3 Technical Requirements

1. **Data Storage and Management**
    - **Available Technologies:** MySQL, PostgreSQL, MongoDB
    - **Chosen Technology:** PostgreSQL is selected for its strong relational structure, ability to handle large tabular datasets, and support for advanced queries such as statistical aggregations of disease occurrences and severity.

2. **Machine Learning Model for Disease Detection**
    - **Available Technologies:** CNN (VGG-16, VGG-19, Inception v4), YOLO v4/v5, classical ML (Random Forest, SVM)
    - **Chosen Technology:** CNNs with VGG-16 and YOLO v5 are selected for image-based disease detection due to their high accuracy in capturing leaf features and identifying multiple disease patterns simultaneously. NLP models will process farmer symptom reports in Sinhala, Tamil, or English to complement image detection.

3. **Dashboard and User Interface**

   - **Frontend:** React Native, chosen for creating a cross-platform mobile app that works on both Android and iOS devices.
   - **Backend:** Flask (Python), for smooth integration with ML and NLP models.
   - **Database:** PostgreSQL for storing images, symptom reports, treatment records, and environmental parameters.

4. **Data Sources**

   - Historical datasets of Aloe Vera disease images from research articles and local farms.
   - Farmer-reported symptom data collected through surveys and mobile submissions.
   - Environmental parameters such as soil pH, temperature, humidity, and rainfall collected from IoT sensors or farmer inputs.

4.4 Wireframes

Figure 13:wireframes logo

Figure 14:wireframe Onboarding

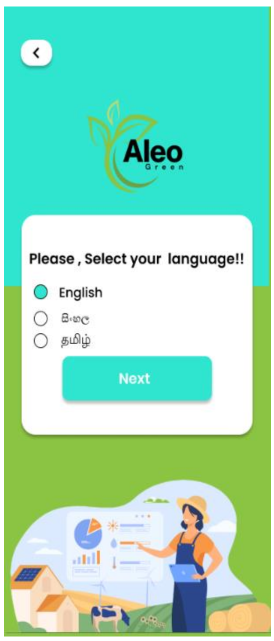


Figure 13:wireframe language select

5.COMMERCIALIZATION

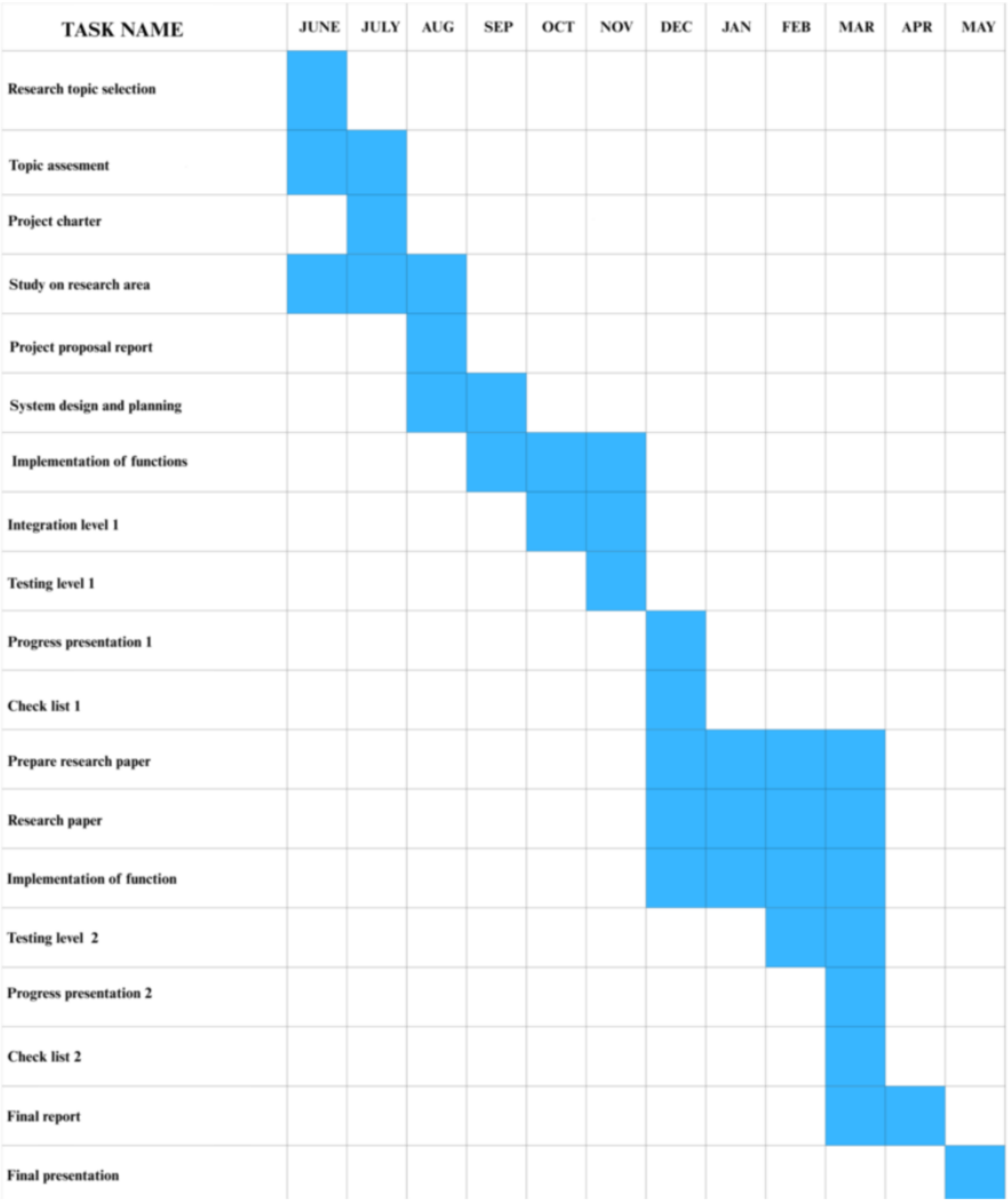
Our proposed smart agriculture support system for Aloe vera is intended to be commercialized as a mobile application to address the specific needs of the Sri Lankan agricultural sector. The target audience includes Aloe vera farmers, agricultural researchers, and stakeholders in the cosmetic and pharmaceutical industries.

The system will be offered in a freemium model with two versions. The Community version will be freely available and will include essential features such as basic disease detection, simple fertilizer recommendations, and general weather alerts. This version aims to establish a broad user base and demonstrate the system's value. The Premium version will be available through a subscription and will offer advanced functionalities. This includes real-time fertilizer management with AI-driven alerts, predictive analytics for market price trends, and more comprehensive yield forecasting.

Our system is designed with a user-friendly interface that does not require advanced technical knowledge or have age restrictions, making it accessible to a wide range of farmers. Our development team, composed of technically proficient graduates with industry experience, is well-equipped to build and maintain this robust platform.

The required funding is estimated at $20 per month, which will cover the operational costs for development and maintenance. Our marketing strategy will focus on targeted outreach within the farming community through agricultural workshops, partnerships with government bodies like the Department of Agriculture, and advertising via local media and social media platforms to ensure maximum visibility and adoption. Revenue will be generated primarily through subscriptions to the premium version, with potential future income from partnerships with agricultural input suppliers and data-driven insights for industry partners.

6. GANTT CHART AND WORK BREAKDOWN STRUCTURE



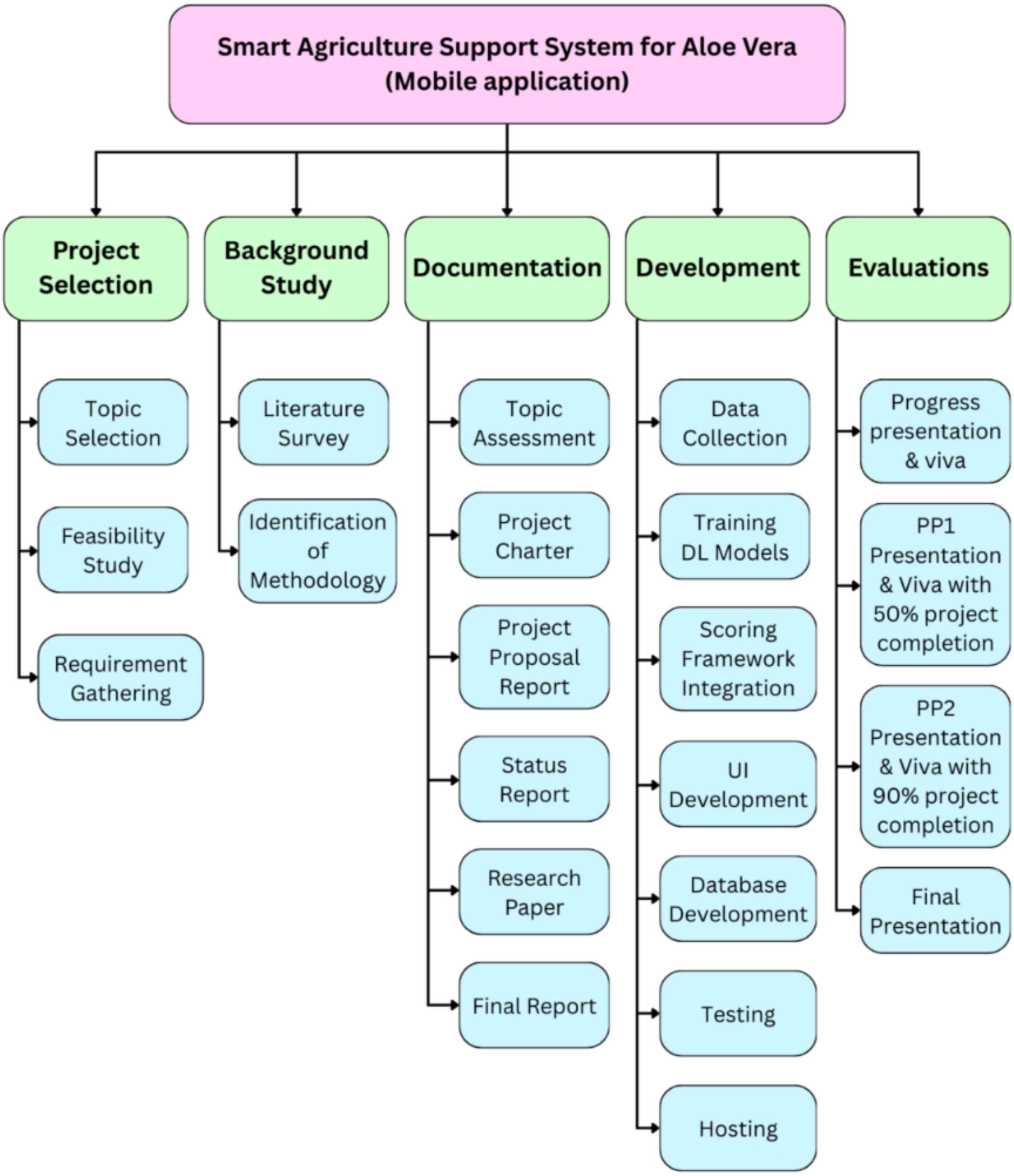


Figure 16:Work Breakdown Structure

Figure 15:Gantt Chart

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APPENDICES

Appendix A: Sample Questionnaire

Form Link:

https://forms.cloud.microsoft/r/uu2kKwmQYf

Appendix B: Field Visit Images

Appendix C: Plagiarism Report

Himash Proposal .pdf

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