Summer Internship

Mobile App for Digital Smart Farming Assistance for Biosecurity

Summer Internship for

Computing Department

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Executive Summary

This report will examine the process of creating digital assistance for farmers. According to [1], Australian agriculture accounts for more than a half of total land use in 2023, about three fourth of water consumption in the span of two years from 2021 to 2022. Interestingly, only 13.6% of goods and services exports can be attributed to agriculture (2022-23). [1] states that biosecurity has been a critical economic risk. The report will identify the following points that can be taken into considerations:

- Features

- Demo

- Future improvements.

- Conclusion and Recommendations

1. Introduction

In a world where technological advancement has been gradually superseding, and ameliorating manual labours in many key areas of development, a tailored and robust mobile app is needed to not only abetting, but assisting farmers in any decision-making process.

Agribusiness has been the cornerstone of most countries in the world according to [3]. Despite this, [2] suggests that pest infestations and weeds along with prolonged rain are major hindrances of an effective agriculture system. Moreover, the use of pesticide is a paramount financial consideration for farmers, which contributes significantly to their difficulties.

This report aims to deliver not only a comprehensive solution, but also an analysis of many different aspects including features, demo, and future improvements to tackle this situation.

2. Features

The mobile application integrates beneficial features which might provide a comprehensive, digital assistance tailored for farmers. The app aims to deliver an agriculture enhancement by incorporating the following innovative features:

i. Live Weather Update: This feature provides real-time weather forecasts in a 5 hour window. Farmers can access forecasts to plan their activities accordingly, minimizing impact of bad weather.

ii. AI - Powered Chatbot: The chatbot runs with Gemini API with an option to switch to another Gemini Model. The multi-round conversation is also embedded with past 10 conversations. Farmers can ask questions, further diagnosing their plants.

iii. Plant Disease Identification: This feature utilizes the camera of the phone, the user will take a picture of the plant and send it out for identification. Recommendation system will include not only biological but also chemical and traditional methods. This might help the farmers in decision making and minimize expensive and intensive testing.

iv. Camera Functionality: The inbuilt camera of the phone will be used to capture images for diagnoses. The app allows for reverse camera facing as well as image cropping to help farmers detect early signs of diseases.

v. Voice input: This feature is designed so that farmers can provide voice input while performing various tasks, enabling user-friendly and efficient interaction.

3. Demo
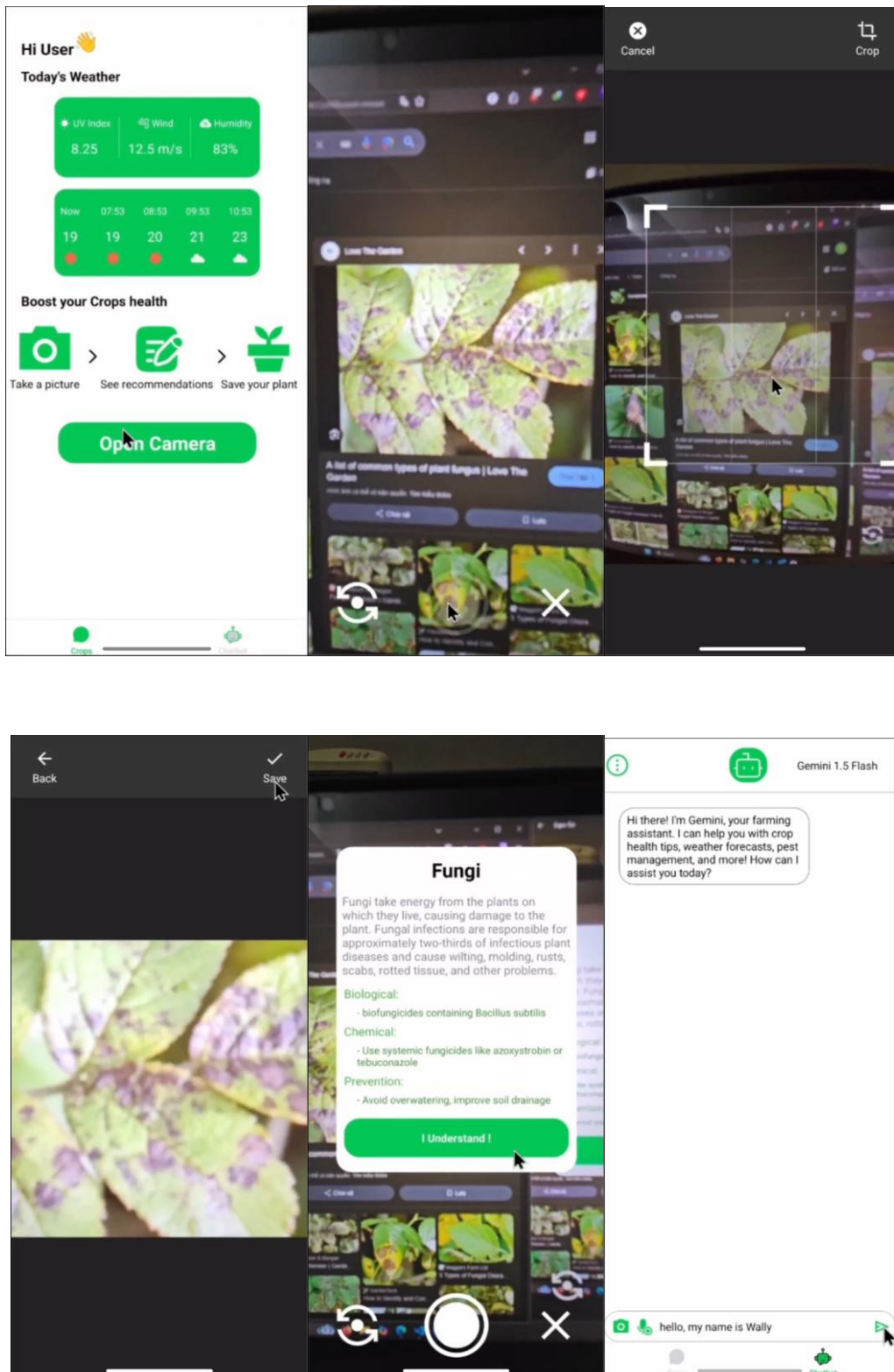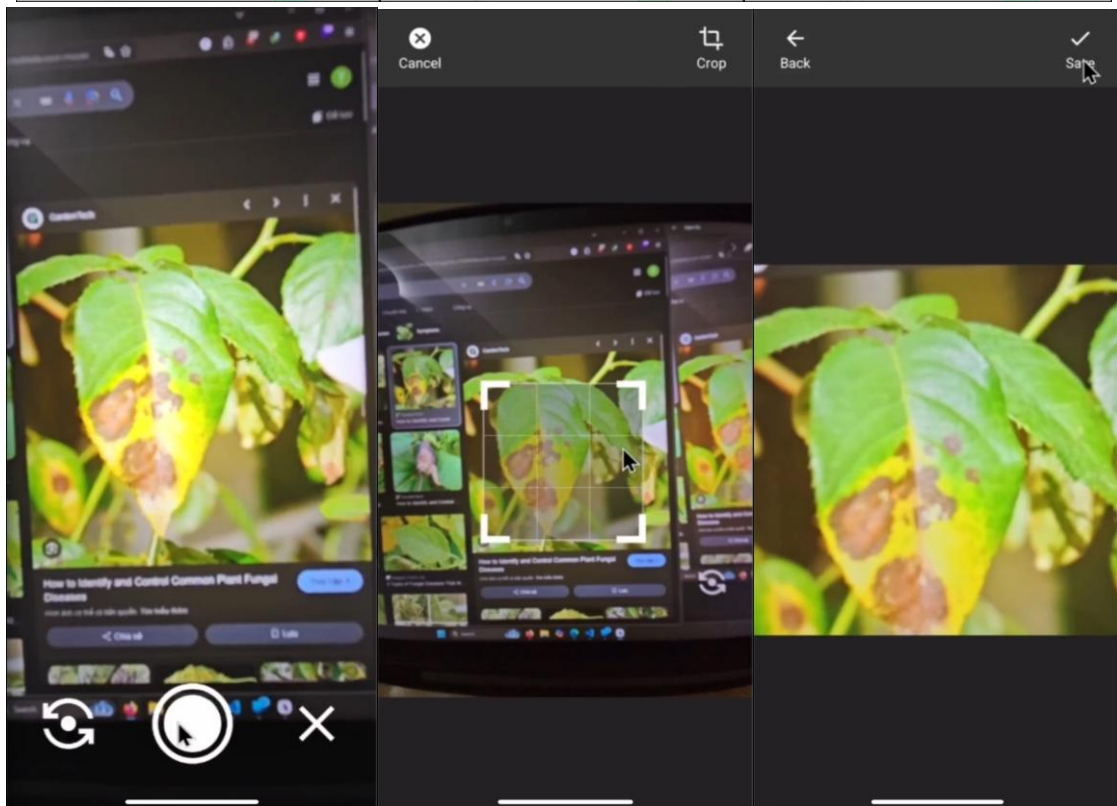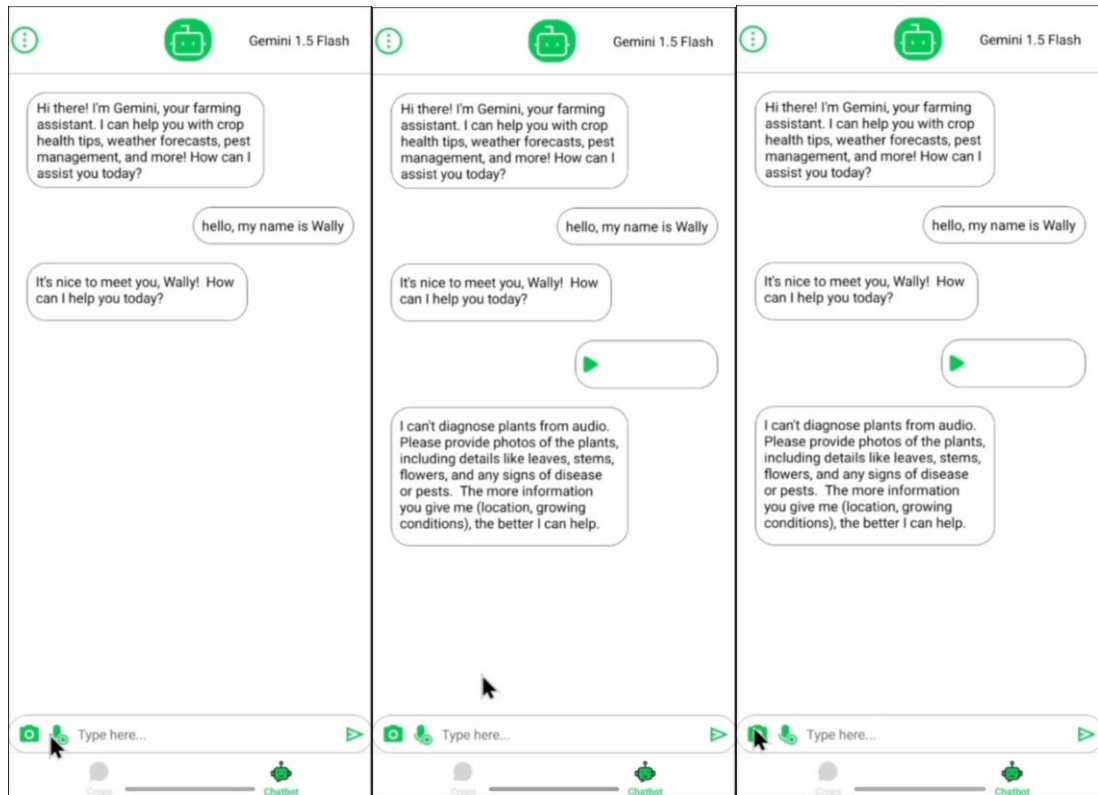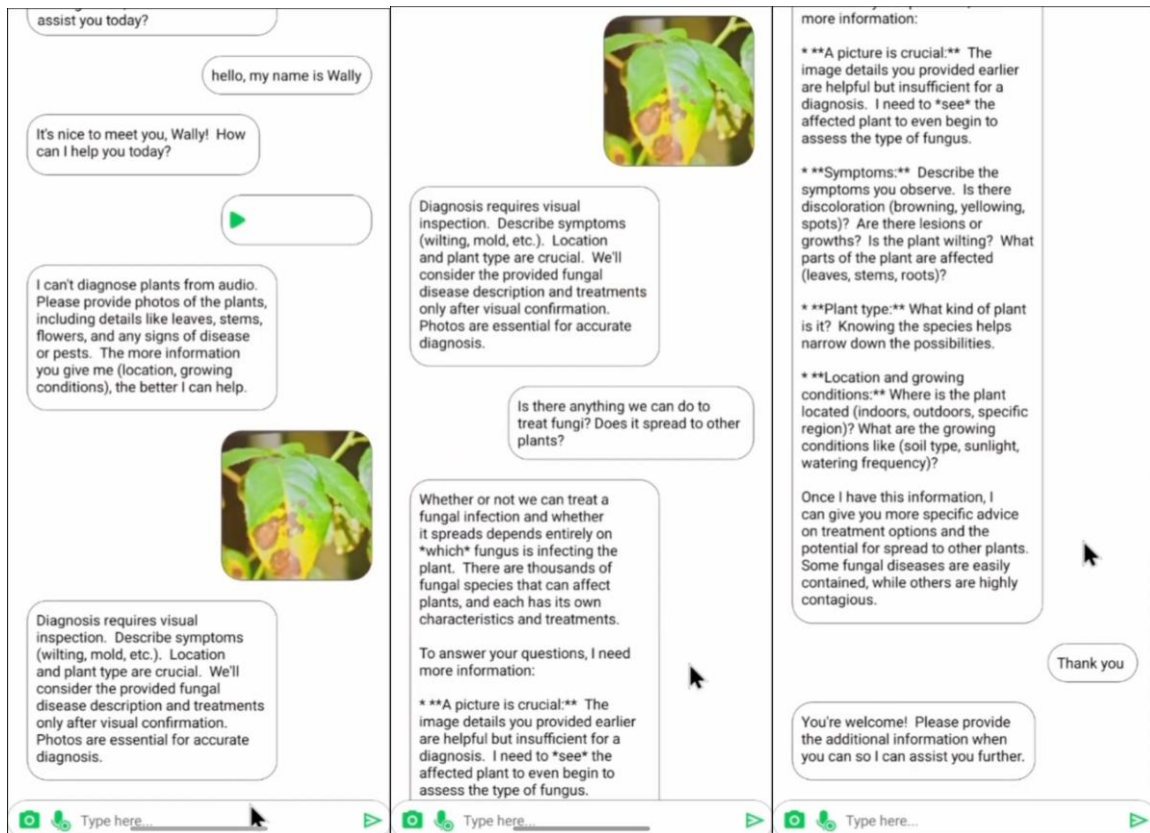
4. Future Improvements

To ensure the app remains future-proof and a cutting-edge tool for farmers, there will be improvement on both technical and non-technical aspects.

4.1. Technical Improvements

The following technical improvements are planned for future app iteration, aiming to continuously improve and refine its functionality.

i. Proprietary Plant Disease Detection Model: An in-house disease detection model will enable more accuracy and region-target diagnosis while reducing on API costs.
ii. Automatic AI model detection: This feature will allow the app to automatically select the most appropriate AI model for the farmers. Optimal performance will be ensured.
iii. Offline Local Model: Ensuring intact functionality in low-connectivity areas, local models that do not require continuous internet access will be integrated. This will allow for real-time decision making.
iv. Plant identification (name, species): Expanding on plant disease detection, plant identification can help farmers identify unseen plants which will benefit their decision-making process.
v. Plant health general assessment: This feature will be built as an addition to the disease detection and plant identification feature. This feature will allow for general assessment which might help farmers diagnose early about potential issues.
vi. Camera Enhancement: Improvement in camera functionality includes flash option for low light conditions and zoom feature for image capture.
vii. Community Page: Farmers can connect with like-minded people and share stories, advice, insights, podcasts, fostering a community.

viii. Additional Assistance: Tools for calculating optimal fertilizer, water management, pest advisory, crop rotations, yield estimator, harvest timing advisor…

ix. Weather Update Location Based: Integrating GPS technology which enables weather changes based on geographical data.

x. Language Support: Expanding the app's language option will make it more accessible to farmers, breaking the language barrier.

4.2. Non-Technical Improvements

i. Gathering feedback: This feature will regularly collect surveys from farmers and experts to ensure that the app meets their needs. Moreover, engaging with farmers helps refine features and improve useability.

ii. Farmers support and training: Providing an app tour or tutorials or customer-support helps farmers to adapt to a new app.

iii. Efficient Project Management: Ensure smooth development by managing tasks, timelines, and priorities.Effective coordination prevents delays and ensures a smooth user experience.

iv. Data Privacy Protection: Implementing strong security measures ensures that farmers' sensitive information remains protected.

v. Unexpected app failures: Facing those unexpected circumstances such as misinformation, or connectivity problems should be addressed swiftly to minimize disruptions. There should be a proactive response plan that helps maintain user confidence and reliability.

vi. Simplicity in design: Prioritizing simplicity improves accessibility and overall user satisfaction. This could ensure farmers can navigate the app with ease, even with minimal digital experience.

vii. News and Update about recent plants or disease: Giving farmers up-to-date information on pest outbreaks, new plant varieties, and emerging diseases aids. Users may stay ahead of any risks and opportunities by keeping the app updated with trustworthy agriculture news.

viii. Plants hotline (contact professional): Farmers can get prompt guidance on plant health, pest management, and best farming methods by calling the Plants Hotline (Contact Professionals), which provides direct access to agricultural specialists.

5. Conclusion and Recommendations

The mobile app designed for farmers provides an intuitive and accessible platform that effectively tackles agricultural challenges, enhancing productivity. The demo video highlights its main features and underscores how it could impact farming efficiency. However, to ensure wider acceptance and sustained success, ongoing enhancements both technical and non-technical are essential.

Furthermore, to ensure that the app stays relevant and user-friendly, it is important to provide regular updates based on user feedback. Future developments can be guided by engaging with the farming community through workshops and feedback sessions. Moreover, it can be scaled to benefit a broader range of ecosystems and farming traditions by adapting it to different regional agricultural practices and conditions.

References

Internet Documents

[1]   ABARES, *Snapshot of Australian agriculture 2024*: *Snapshot of Australian Agriculture 2024 - DAFF*. Available at: https://www.agriculture.gov.au/abares/products/insights/snapshot-of-australian-agriculture (Accessed: 1 February 2025).

[2]   Touch , V. *et al.* (2024) *Smallholder Farmers' challenges and opportunities: Implications for agricultural production, environment and food security*, *Journal of Environmental Management*. Available at: https://www.sciencedirect.com/science/article/pii/S0301479724025222 (Accessed: 01 February 2025).

[3]   PricewaterhouseCoopers (no date) *Food and agribusiness*, *PwC*. Available at: https://www.pwc.com.au/agribusiness.html (Accessed: 01 February 2025).