

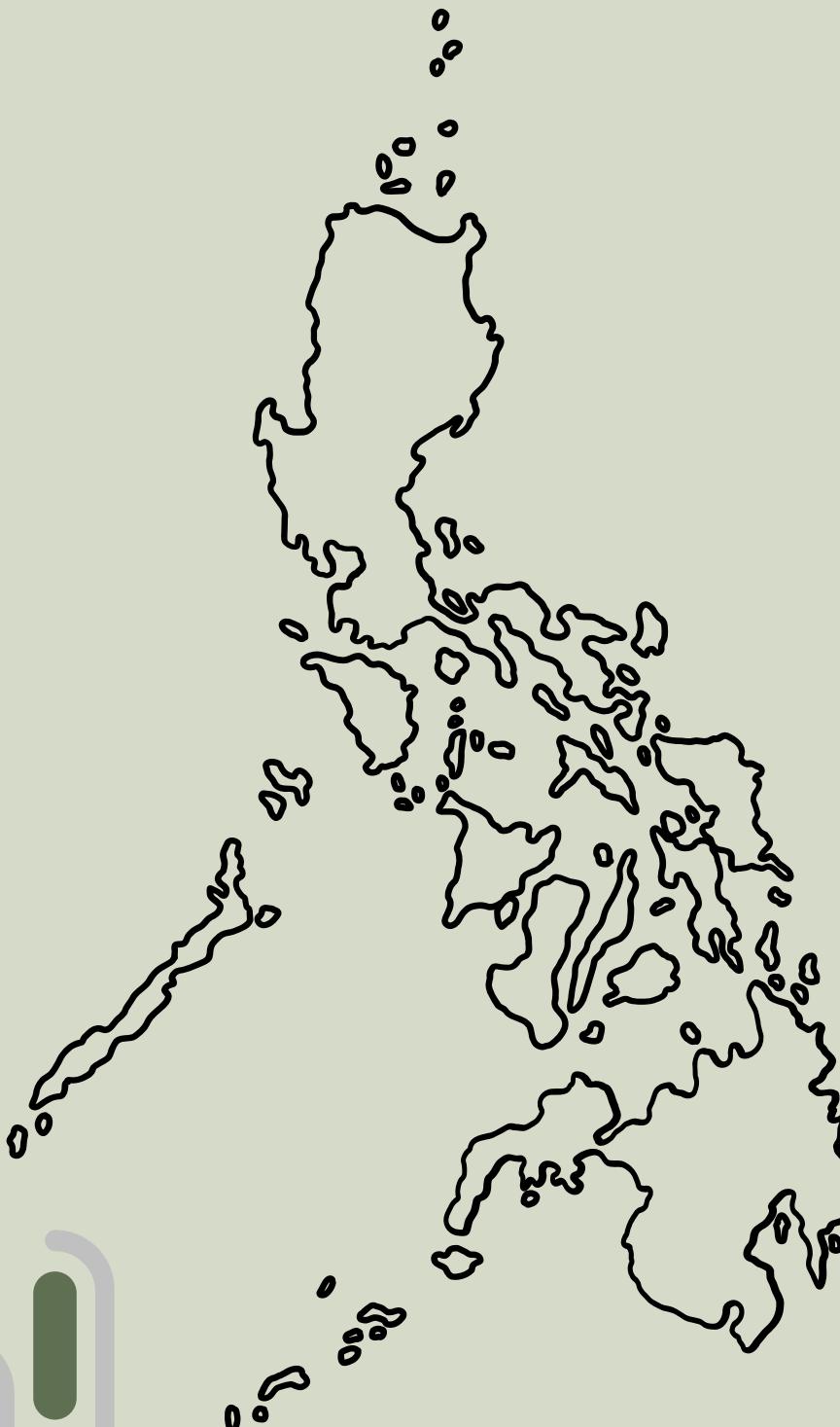


# **SAKAHAN**

**A Web-GIS Application with Dynamic Data Management for  
Crop Suitability Mapping in the Philippines**

**16 May, 2025**

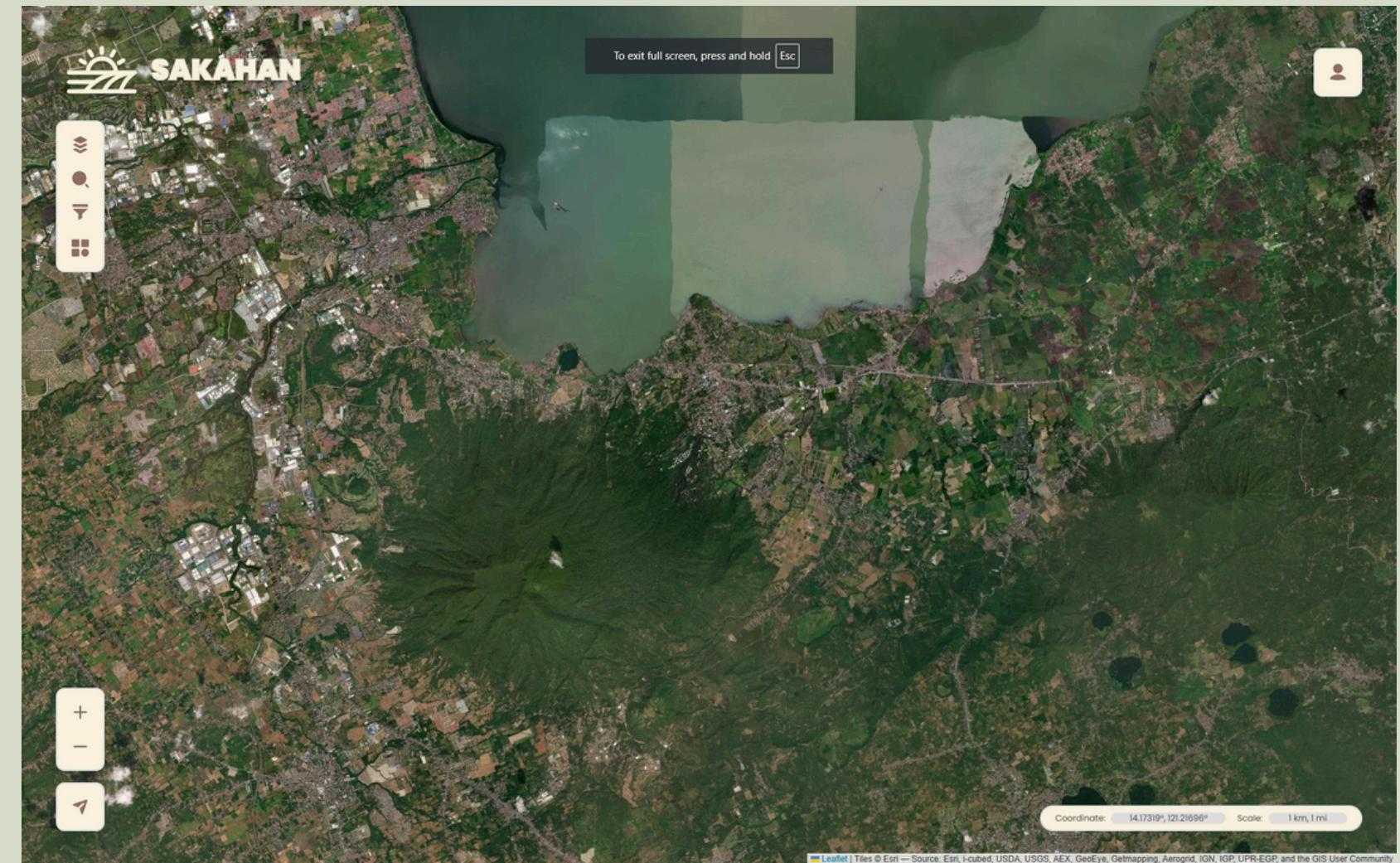
# THE PROBLEM



- The **different land areas** in the Philippines can have **distinct land uses**, especially in crop production, because the country is an **archipelago**.
- According to the study and statistics, a **notable decline in soil fertility has been observed** over the years.
- Planting **efficient crops in optimal locations enhances crop productivity**.
- Achieving an **effective suitability mapping is not feasible without sufficient data** on the soil characteristics.
- NCCAG and SARAI have been developed for these purposes, but they **lack dynamic data management**.
- Existing spatial data sources **may not provide enough information**.

# THE SOLUTION

- A **Web-GIS application with dynamic data management capabilities** to enable stakeholders manage a broader range of crops and land areas.
- Streamline **decision-making with actionable insights** into suitable land use and eliminate guesswork in finding cultivable land areas for various crops.



# SAKAHAN

# OBJECTIVES OF THE STUDY

The general objective of this study is to develop a Web-GIS application for crop suitability mapping. Specifically, this study aims to achieve the following objectives:

## OBJECTIVE 1

To develop and implement a suitability mapping application based on Web-GIS architecture.

## OBJECTIVE 2

To incorporate data management features to support dynamic data within the application.

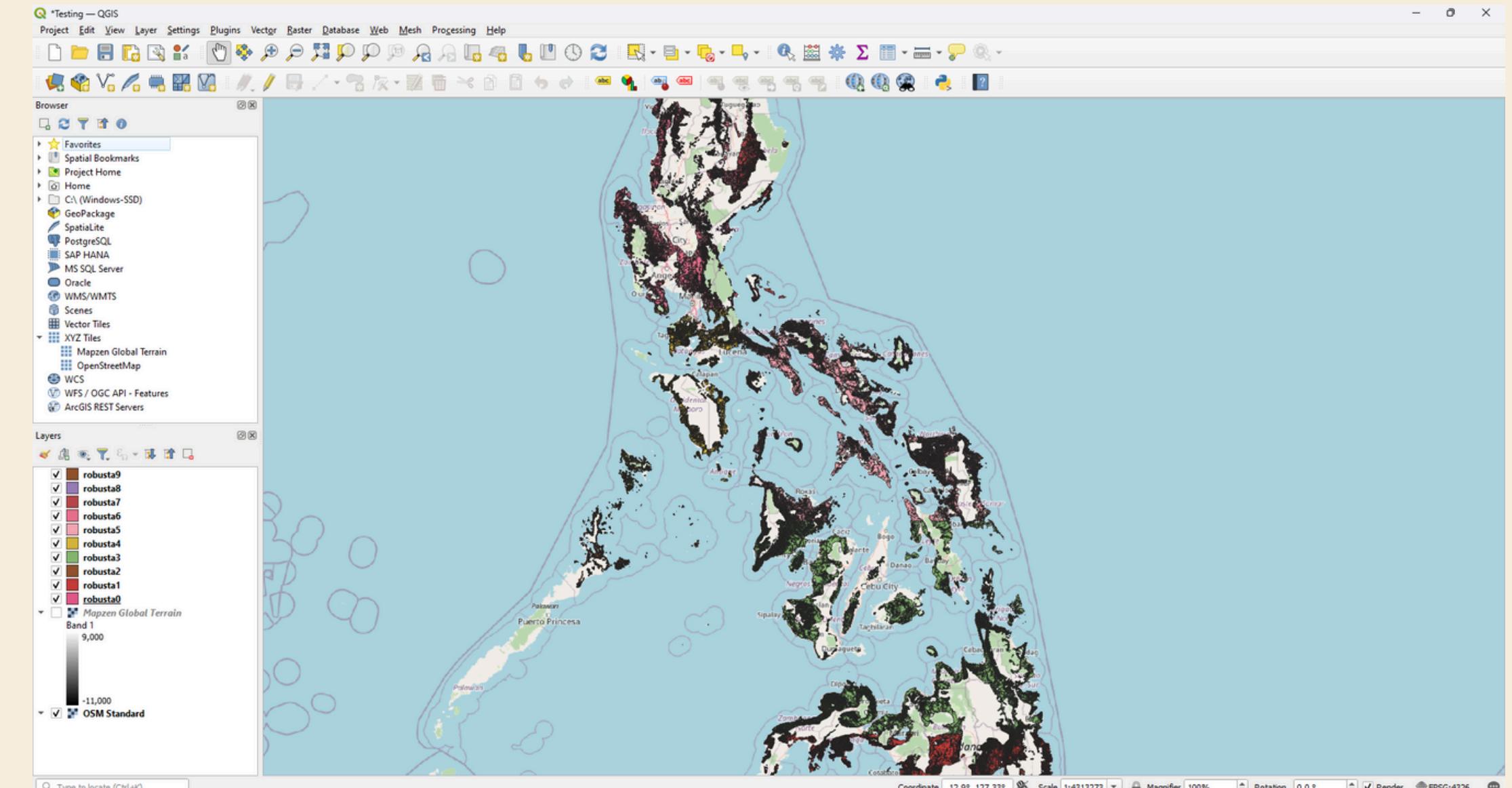
## OBJECTIVE 3

To evaluate the stakeholder acceptance of the application using the System Usability Scale (SUS).

# METHODOLOGY

## Spatial Data Sources

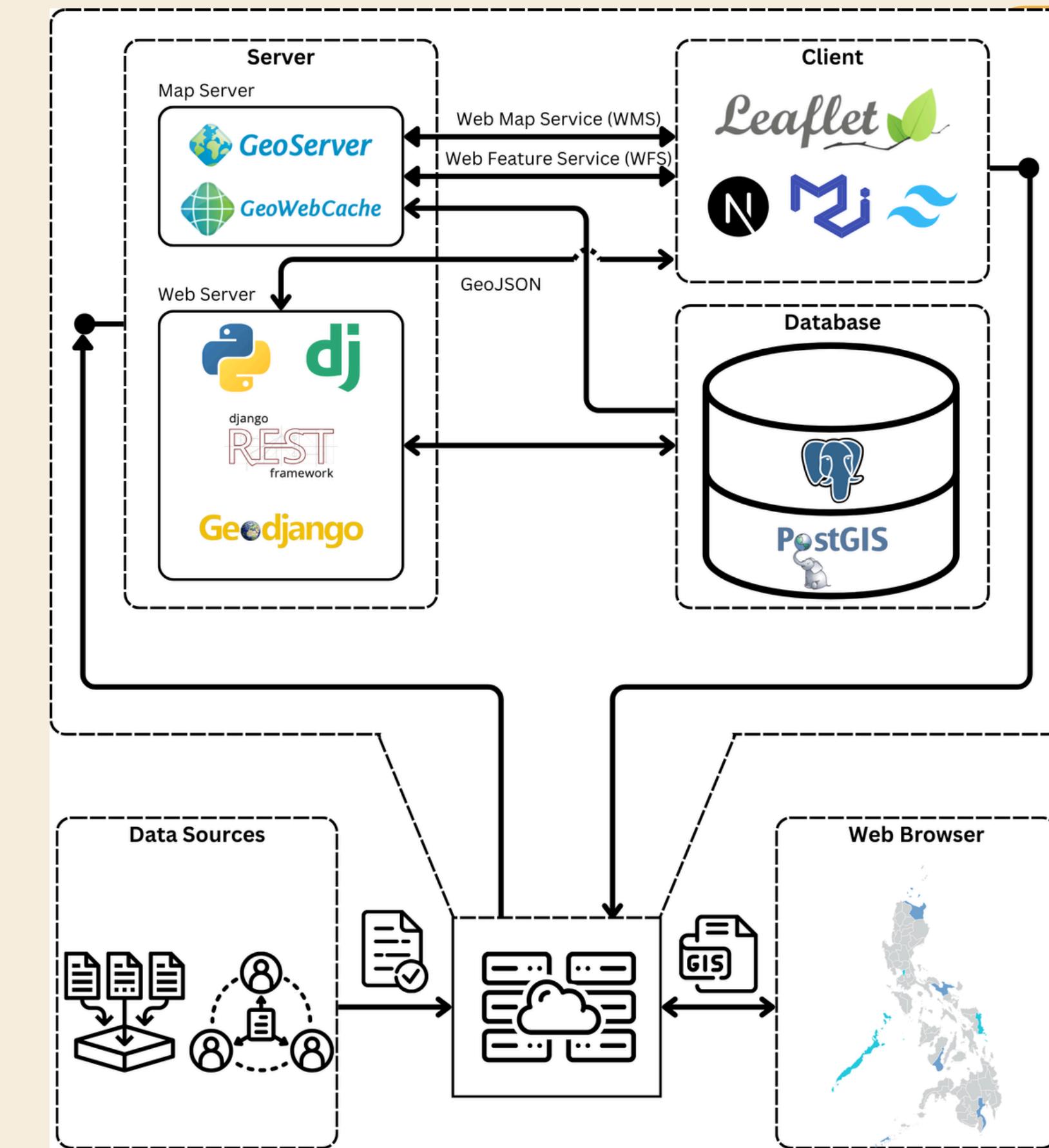
- Suitability Map for Lowland Rice, Cacao, Robusta Coffee, Banana, Arabica Coffee, Corn, and Coconut
- Shapefile format



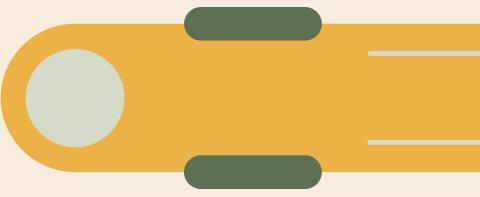
# METHODOLOGY

## System Architecture

- Map Server
- Web Server
- Client
- Database

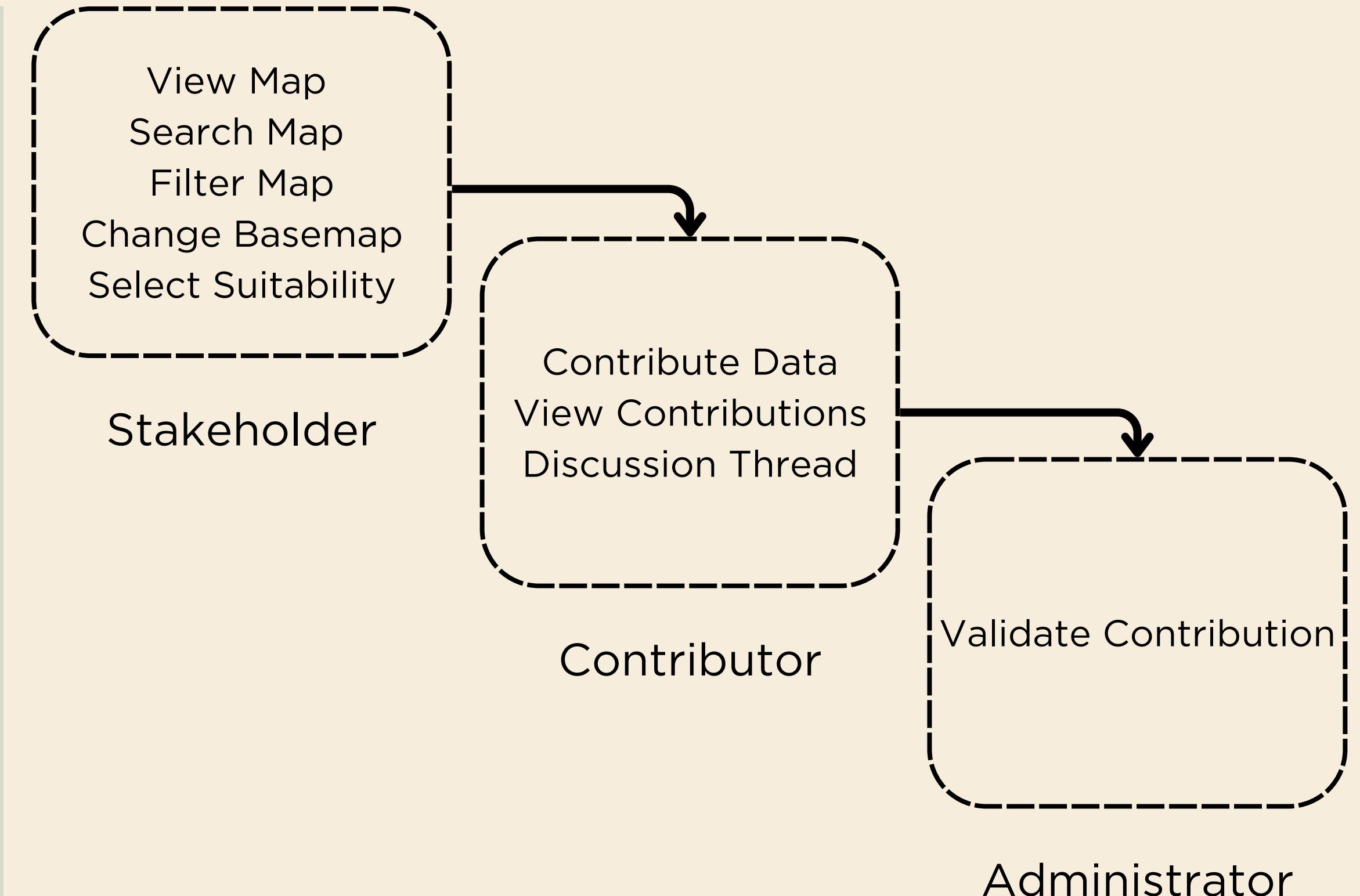


# METHODOLOGY



## Application Features

- Users have varying privileges according to their roles within the system.
- High-Fidelity Wireframe



# METHODOLOGY

## Testing Procedure

- The System Usability Scale (SUS) is used to evaluate the usability of the application.

### Participant Demographics

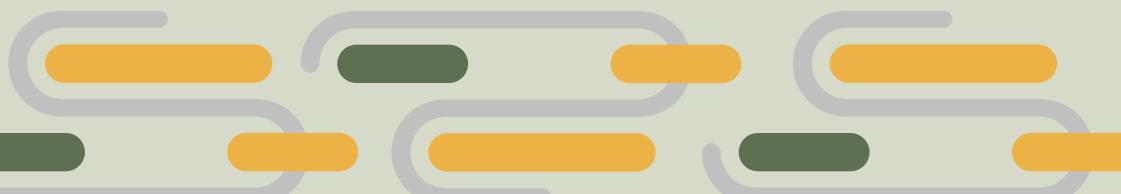
A sample of 20 students was drawn from a population that had previously completed a soil science or related course.

### Usability Survey

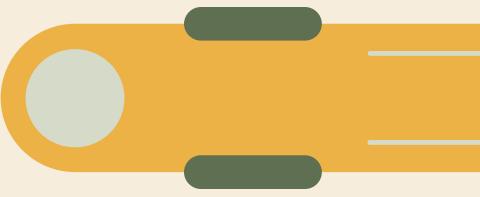
Participants completed a questionnaire based on the System Usability Scale (SUS).

### Usability Testing

Participants test the application by following the given task.

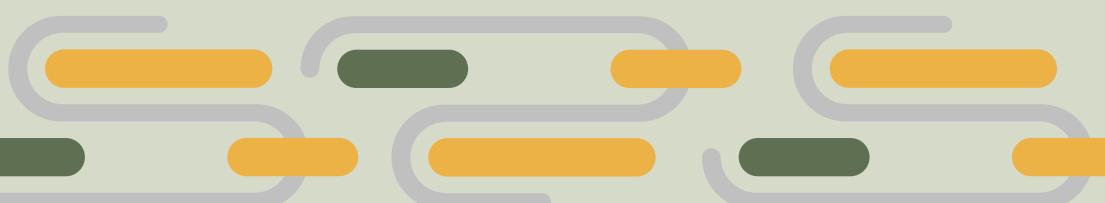


# METHODOLOGY



## Deployment

- Digital Ocean
- 2 App Platforms
- 1 Droplet
- 1 Database Cluster
- 1 Spaces Object Storage



Component	Specification	Cost
sakahan-frontend	512 MB RAM 1 Shared vCPU 50 GB bandwidth	\$5.00/mo
sakahan-backend	512 MB RAM 1 Shared vCPU 50 GB bandwidth	\$5.00/mo
sakahan-droplet	4 GB RAM 2 Shared vCPU 25 GB SSD 4 GB Transfer	\$32.00/mo
sakahan-database	1 GB RAM 1 Shared vCPU 10 GB SSD	\$15.15/mo
sakahan-bucket	250 GB SSD 1 TB bandwidth	\$5.00/mo

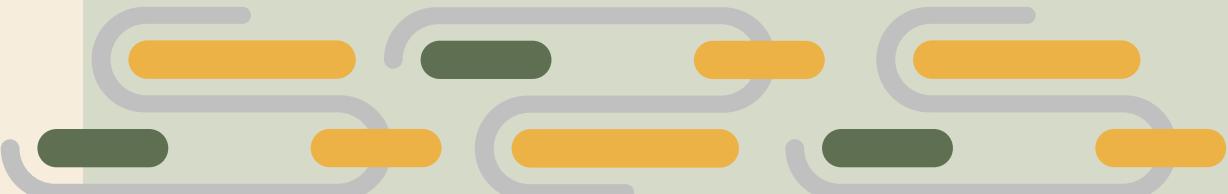


# RESULTS AND DISCUSSION



# SAKAHAN

**Web Application Demo**  
• SAKAHAN



# RESULTS AND DISCUSSION

TABLE III  
SYSTEM USABILITY SCALE SCORE

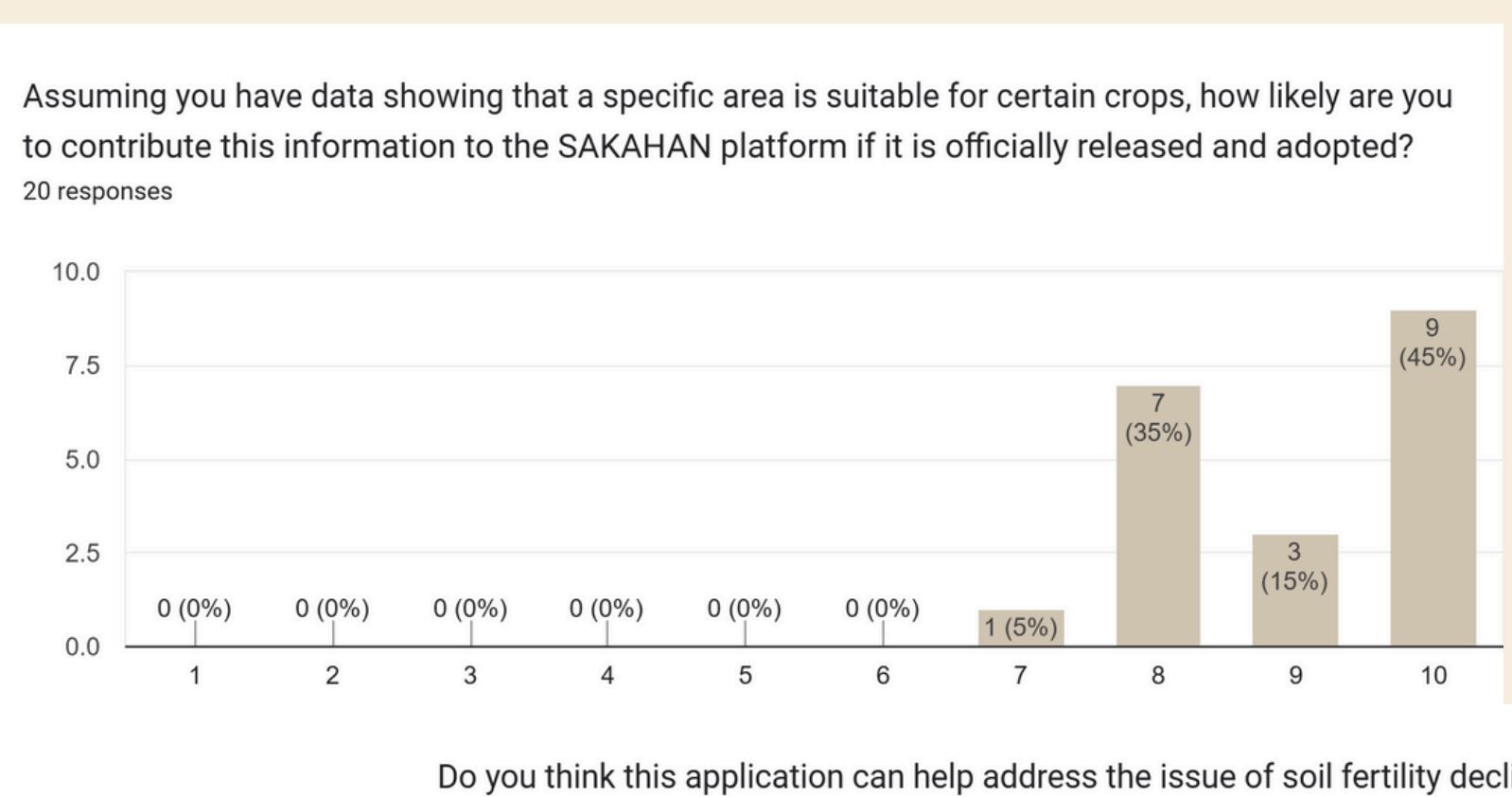
Resp.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Score
1	5	3	3	3	4	3	4	2	4	5	60
2	5	1	5	1	5	1	5	1	5	1	100
3	4	2	4	2	5	2	5	2	4	2	80
4	4	4	5	2	4	3	5	2	4	4	67.5
5	4	2	4	2	5	2	4	1	5	2	82.5
6	4	4	4	3	3	4	4	4	4	4	50
7	4	3	3	4	2	3	2	3	4	4	45
8	4	3	3	4	4	3	4	2	4	3	60
9	5	2	5	1	5	1	5	1	5	2	95
10	5	2	5	2	5	2	5	2	5	2	87.5
11	3	2	5	1	4	2	5	2	5	2	82.5
12	5	2	4	4	4	3	4	1	4	1	75
13	5	2	4	3	5	1	5	1	5	2	87.5
14	4	1	5	1	5	1	2	1	4	1	87.5
15	4	1	5	2	4	2	5	1	5	2	87.5
16	5	2	4	2	5	1	4	2	4	2	82.5
17	4	1	5	4	5	1	4	1	4	1	85
18	4	2	5	1	5	1	5	1	5	2	92.5
19	4	2	5	2	4	2	4	1	4	2	80
20	5	1	5	2	5	2	5	2	5	2	90

Average SUS 78.875

## System Usability Testing

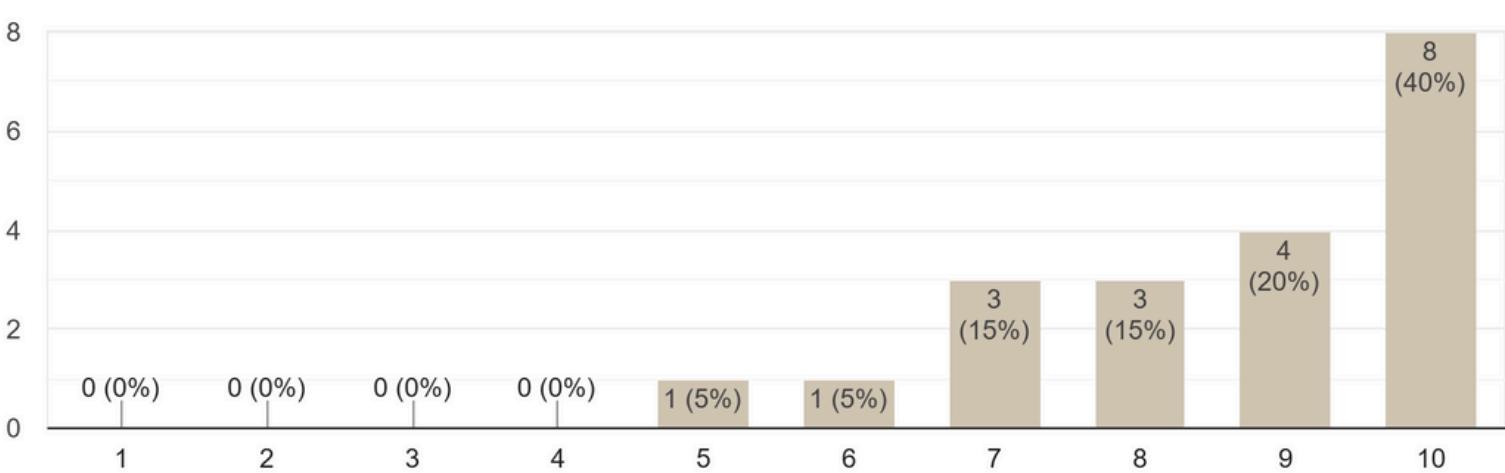
- Average SUS score of 78.875 out of 100.
- Corresponds to B+ rating, which is generally above average

# RESULTS AND DISCUSSION



Do you think this application can help address the issue of soil fertility decline through efficient crop suitability mapping and data-driven land management?

20 responses



## Participant Feedback

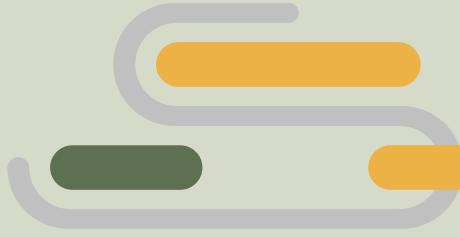
- Willingness to contribute crop suitability data indicate a very high level of intent.
- Expressed strong belief in the application's potential to help address soil fertility decline.

# RESULTS AND DISCUSSION



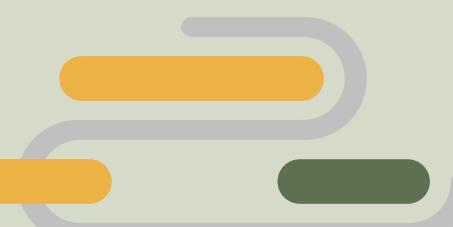
## Stakeholder Feedback

- Emphasized that the idea has practical applications and could be a helpful tool for local government units and farmers.
- Several recommendations.



# CONCLUSION

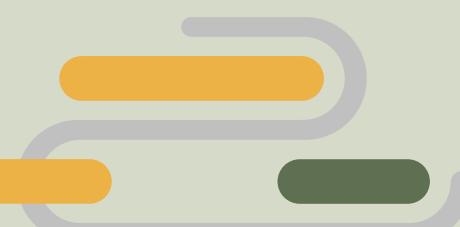
- All of the features were implemented. SAKAHAN offers core features for all users such as map viewing, basemap changes, crop filtering, area search, and suitability selection. Authenticated users can contribute and discuss data, while Administrator can approve/reject contributions.
- Achieved a 78.875 SUS score (B+ rating) – indicating strong usability and user satisfaction.
- Positive participant feedback as users appreciated its user-friendly interface, accessibility, and potential to empower data-driven agricultural planning
- Positive stakeholder feedback, notably from Prof. Moises Dorado, encouraged further development, including remote sensing integration
- Overall, SAKAHAN is a promising and practical platform for addressing soil fertility issues through informed land management





# RECOMMENDATION

- Improve user experience.
- Separate the crop management module.
- Explore a different caching strategy.
- Explore remote-sensing data.
- Explore other data integration methods.





**THANK YOU**