JKUAT-KSA SMALL SCALE CROP MAPPING USING AI/ML

RESEARCH CHAIR 2021/2022- Midterm Review

OVERVIEW

1 INTRODUCTION

Project Background

2 PROJECT TEAM

Student Participants and the project lead

3 PROBLEM STATEMENT

Enhancing the development of efficient farming and monitoring

4 AREA OF INTEREST

Where is our study area?

5 METHODOLOGY

The ultimate flow of events

6 RESULTS

What we have achieved so far

7 CHALLENGES

Encountered setbacks and problems

8 ACKNOWLEDGEMENT

Wrap up

1

INTRODUCTION

Of what relevance is the project?

MISSION BACKGROUND

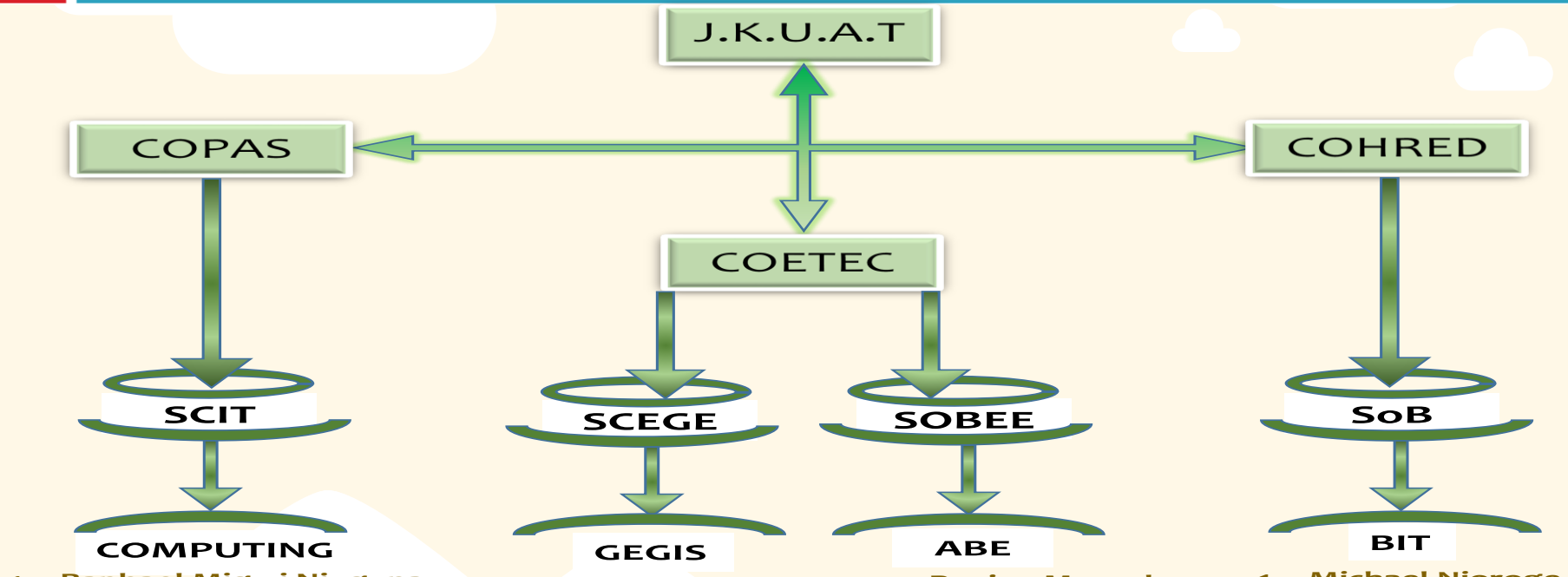
- UN SDG 2- Zero hunger advocates for sustainable food production and supply systems. About 8.9% of the world's population goes hungry every year. In Kenya, the agriculture economy contributes to 26% of the GDP (FAO, 2022). However, Kenyan farmers are threatened with adverse climate actions and natural hazards including pest outbreaks.
- The JKUAT team seeks to combine orthodox agricultural indices with space-based technology, in conjunction with agricultural experts to solve the problem of food security by using AI to equip farmers remotely with information, both in office(Website) and in the farm (Using Mobile GIS). These advanced technology will help small-scale farmers to invest in precision agriculture and management of pests and diseases to achieve maximum food production with reduced farm inputs.

2

PROJECT TEAM

A multi-disciplinary approach to problem solving

PROJECT TEAM



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3

PROBLEM STATEMENT

What challenge do we seek to solve?

PROBLEM STATEMENT

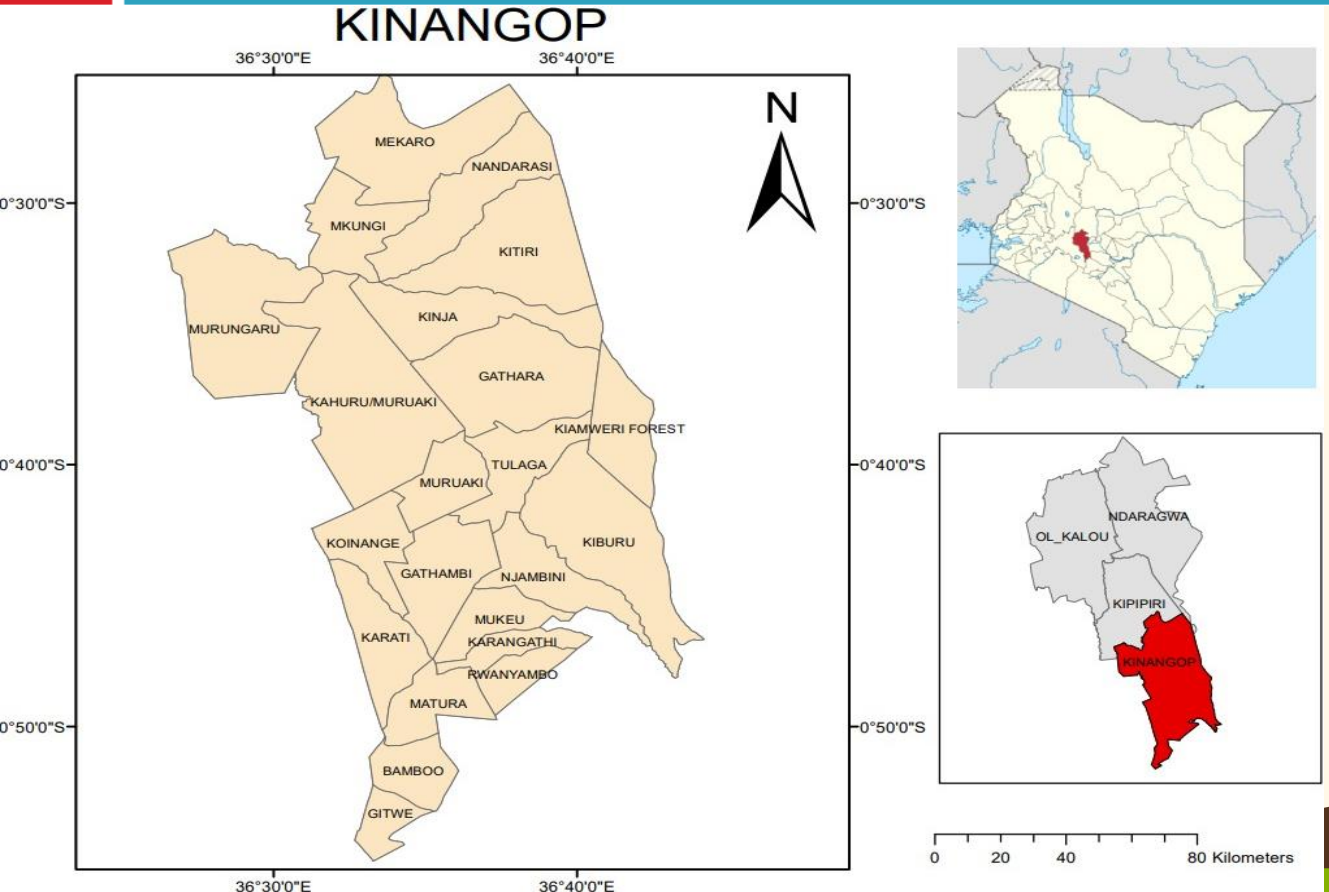
- Food security and the access to adequate safe and nutritious food remains a challenge to people in Kenya and the world at large. There is need to promote and support sustainable agriculture, small scale farmers and equal access to land, technology and markets (FAO Assembly,2015).
- Therefore, it is necessary to make data available and actionable to farmers, and can be achieved by integration of extensive ground truth data collected from the field with high quality Earth observation data.

4

AREA OF INTEREST (AOI)

Our chosen study area

STUDY AREA MAP



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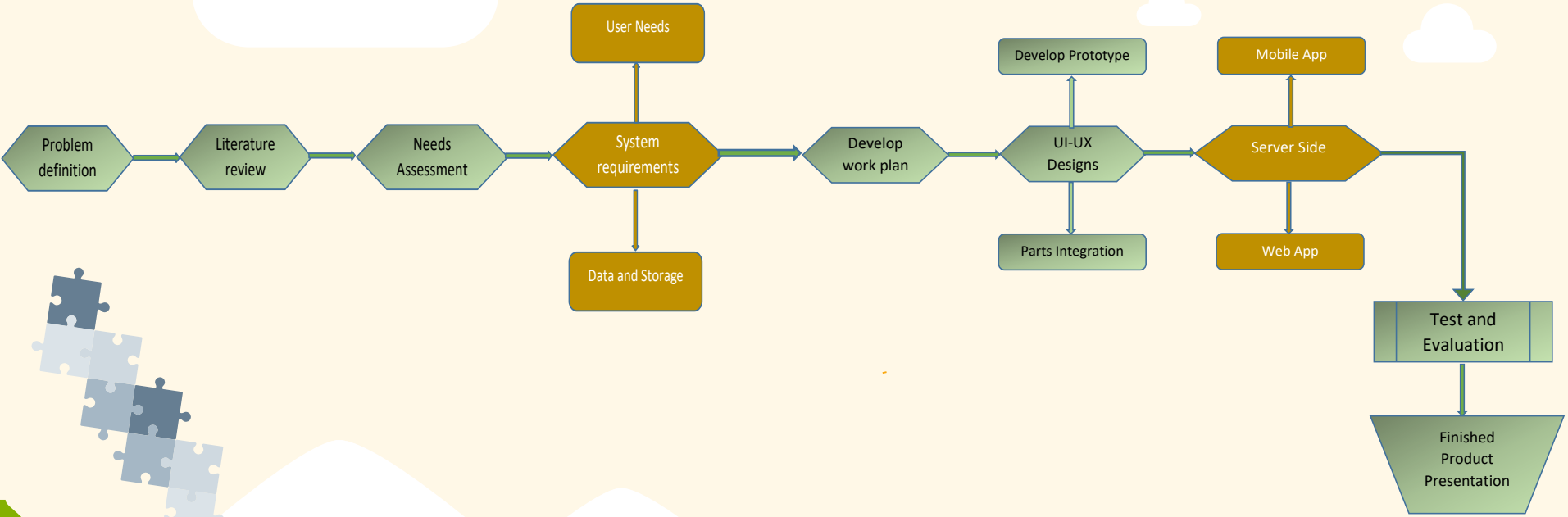
METHODOLOGY

Our project breakdown and guiding steps

METHODOLOGY



METHODOLOGY

- Problem definition: food security & SDG-2
- Literature review and research: preceding literature
- Needs assessment: user, system and data requirements
- Establishing a suitable work plan
- Developing the system model (prototype)
- Testing, Evaluation Refinement and Validation (UAVs)
- Finished product
- Results Presentation and Adoption: the system & documentation

Small Scale Farmers Monitoring Crops on Phone

6

RESULTS SECTION

What have we achieved so far?

GOOGLE EARTH ENGINE

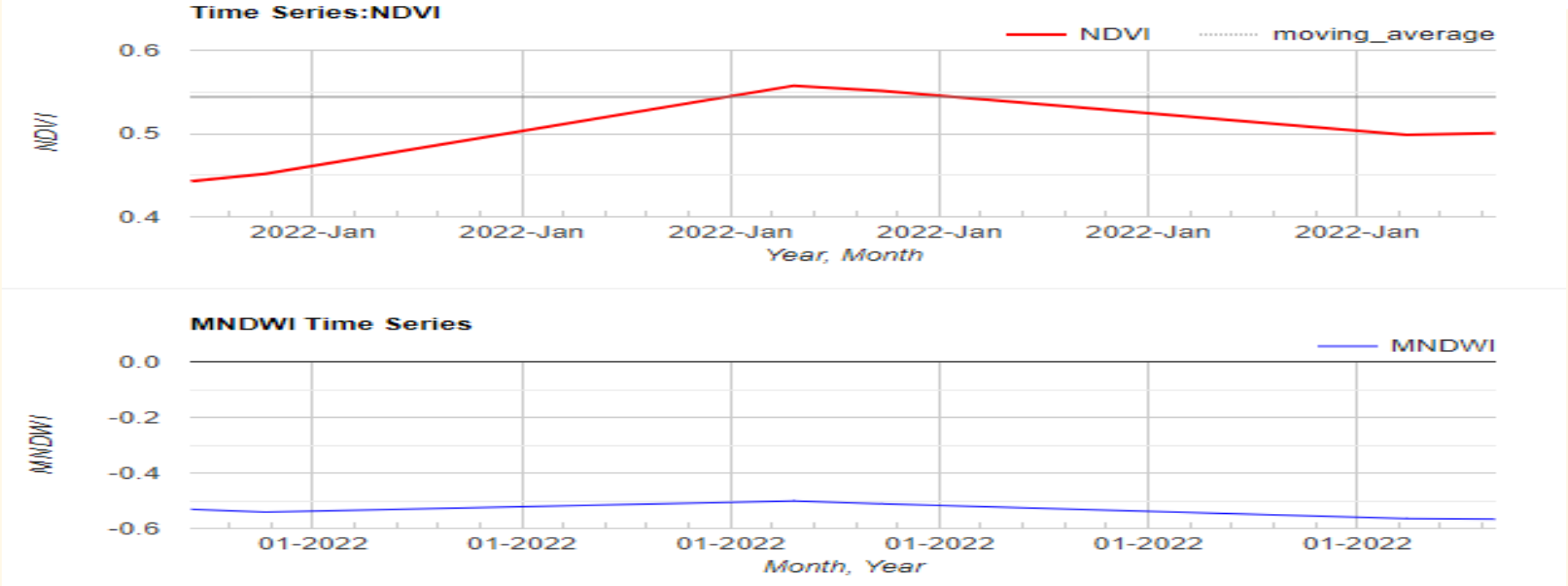
The following indices have been calculated for Sentinel 2 MSI;

- NDVI (Normalized Difference Vegetation Index)
- MNDWI (Modified Normalized Difference water Index)
- SAVI (Soil Adjusted Vegetation Index)
- NDRE (Normalized Difference Red Edge)
- NDMI (Normalized Difference Moisture Index)

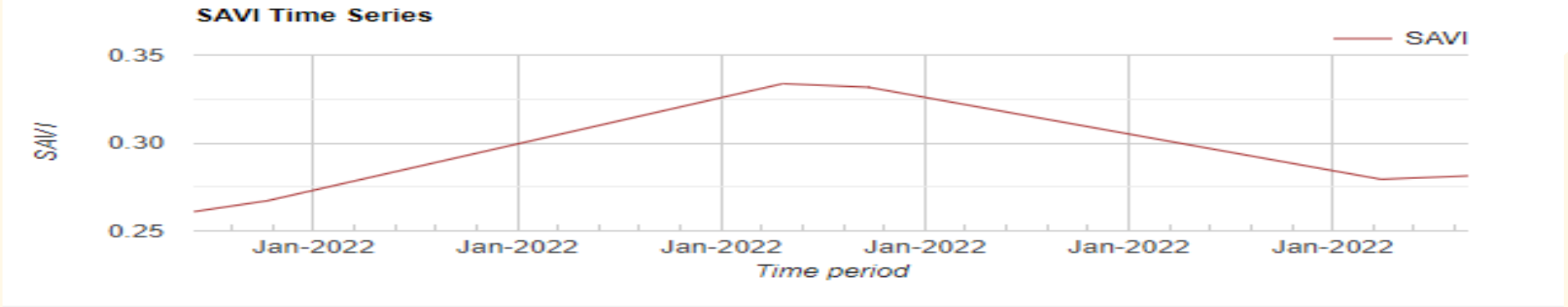
We are also keen on including ReCl for the Sentinel 2A/2B Satellites.
Landsat will lack this index due to lack of presence of the Red Edge band.

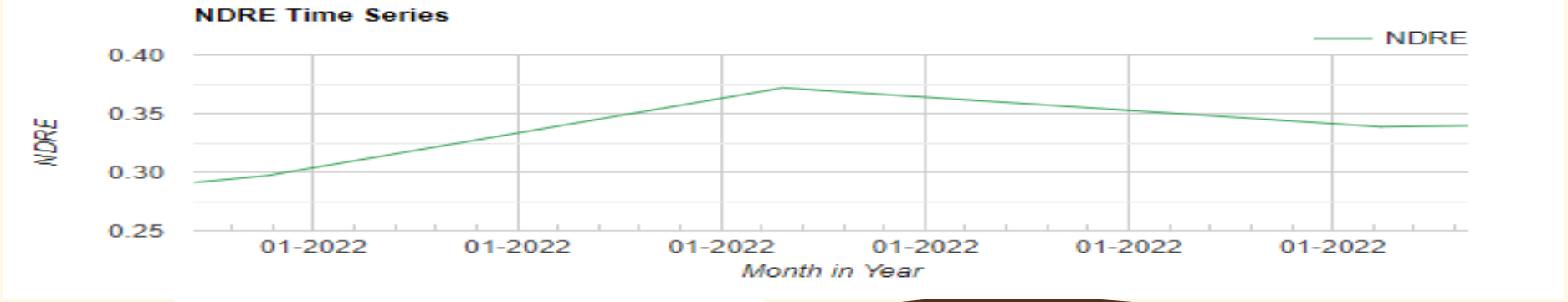
GOOGLE EARTH ENGINE

The following indices have been calculated for Sentinel 2 MSI;



GOOGLE EARTH ENGINE





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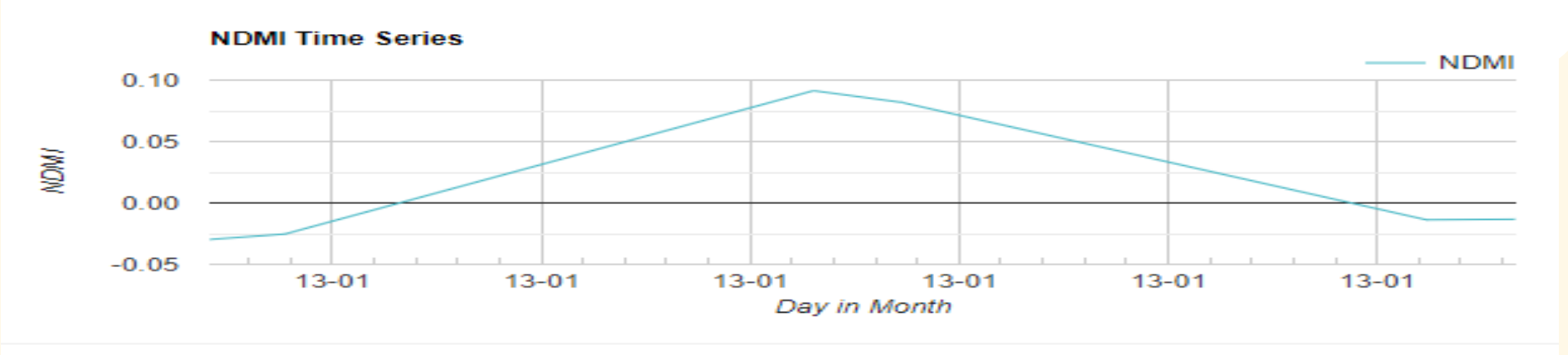
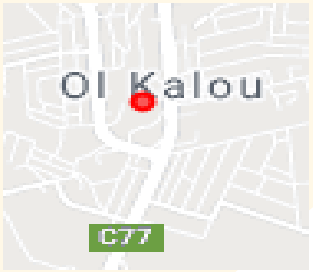
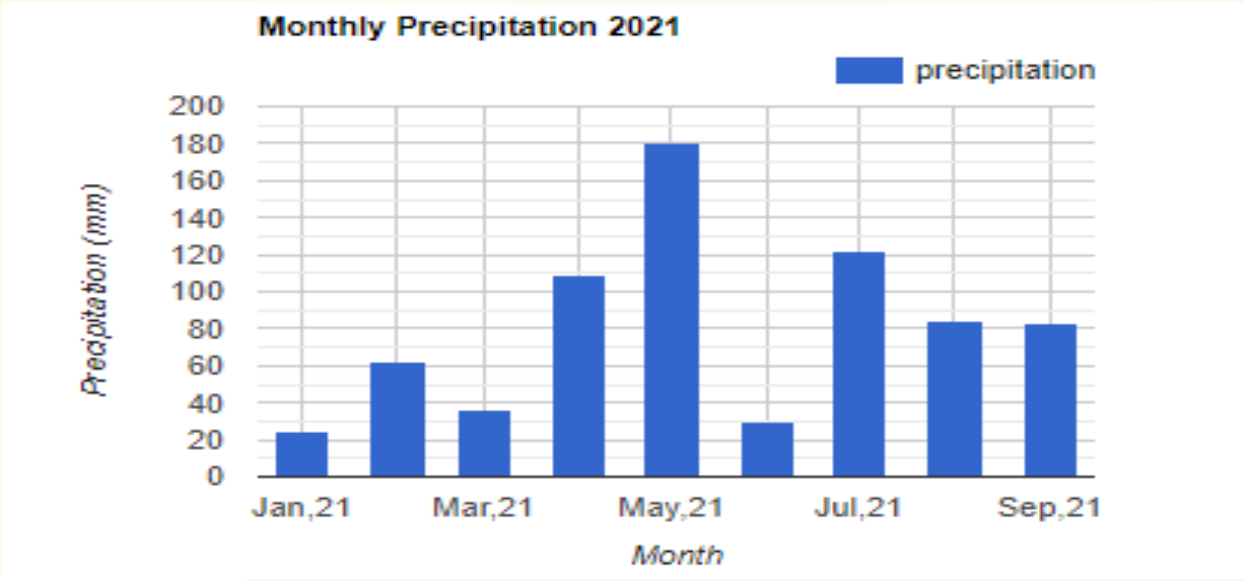


- We are also utilizing the Global Precipitation Measurement (GPM) which is an international satellite mission to provide next-generation observations of rain and snow worldwide every three hours. We seek to obtain rainfall estimates which will help in determining irrigation needs throughout the growing season.

GOOGLE EARTH ENGINE

- The image below shows precipitation data for the year 2021:
- The user Interface will implement such realizations (e.g. a red dot upon clicking the map)





WEB APPLICATION

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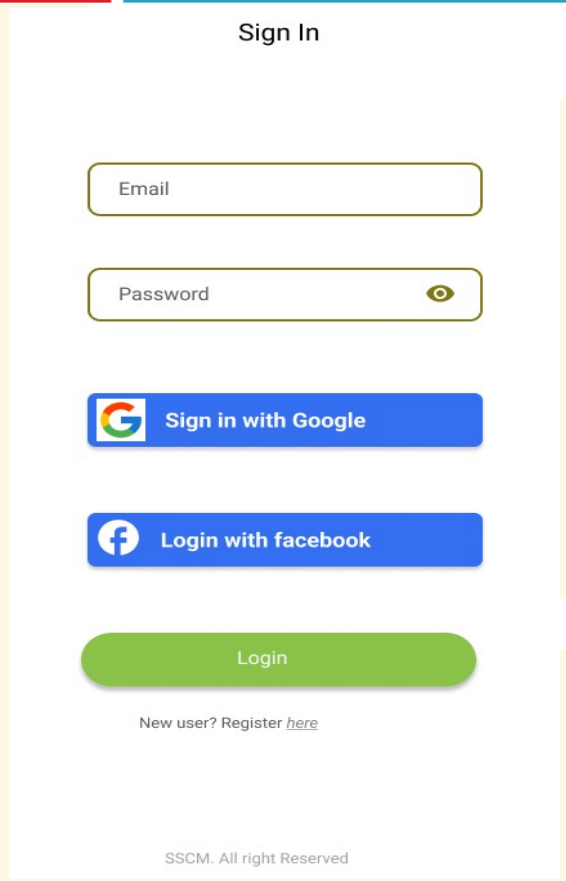
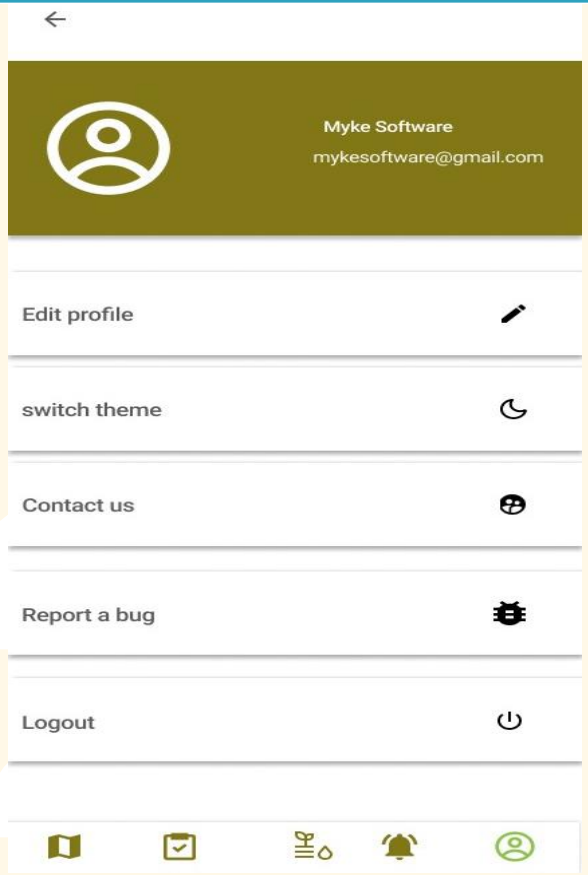
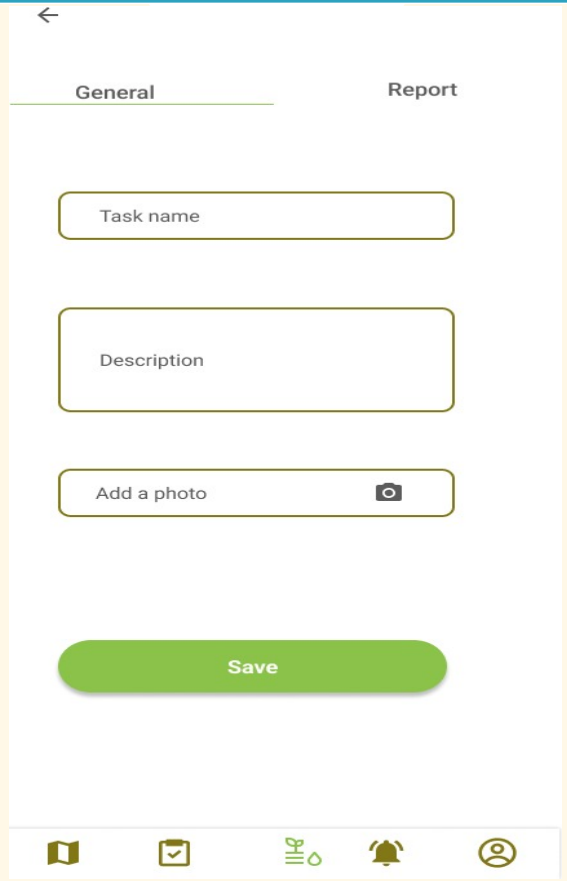
WEB APPLICATION

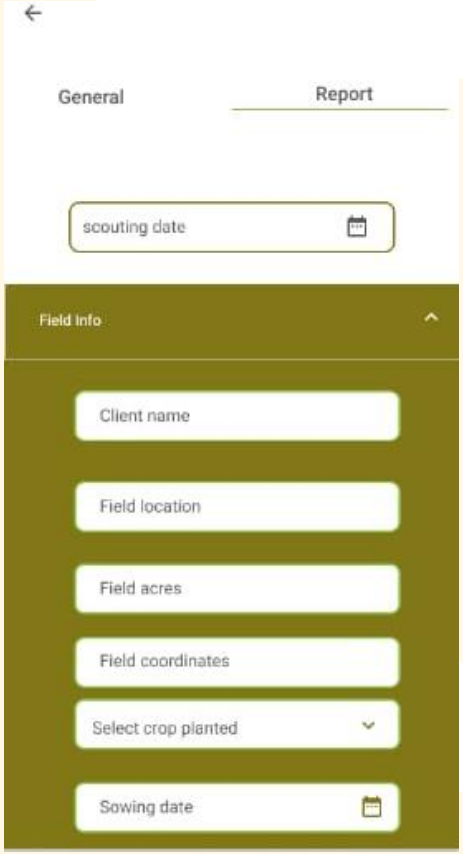
MOBILE APPLICATION

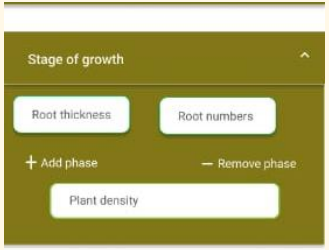


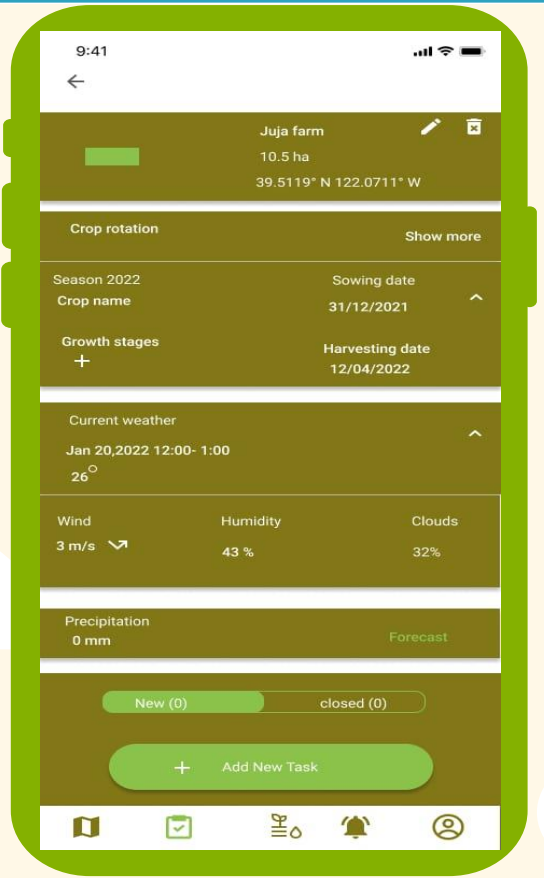


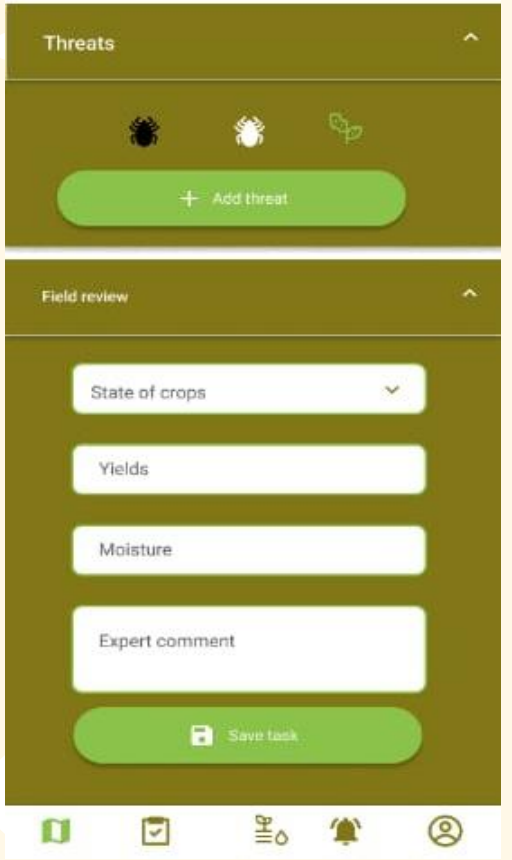


MOBILE APP DASHBOARD AND UI









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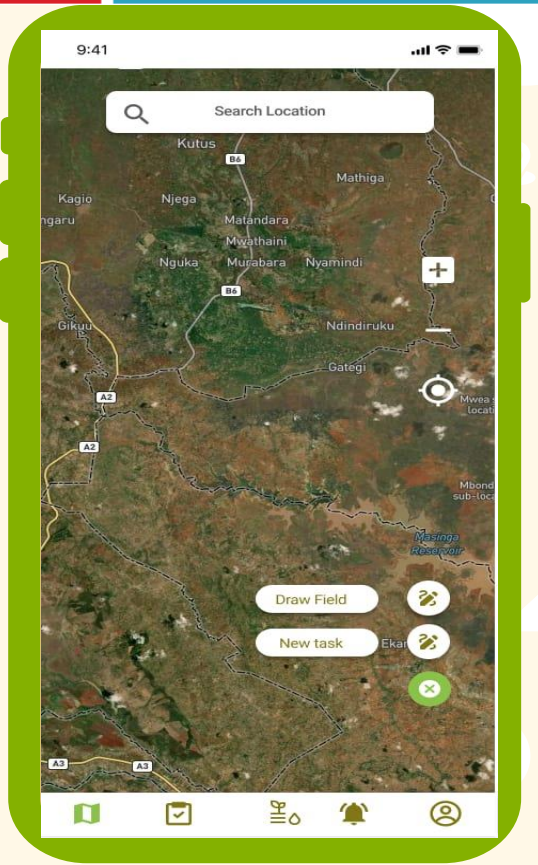

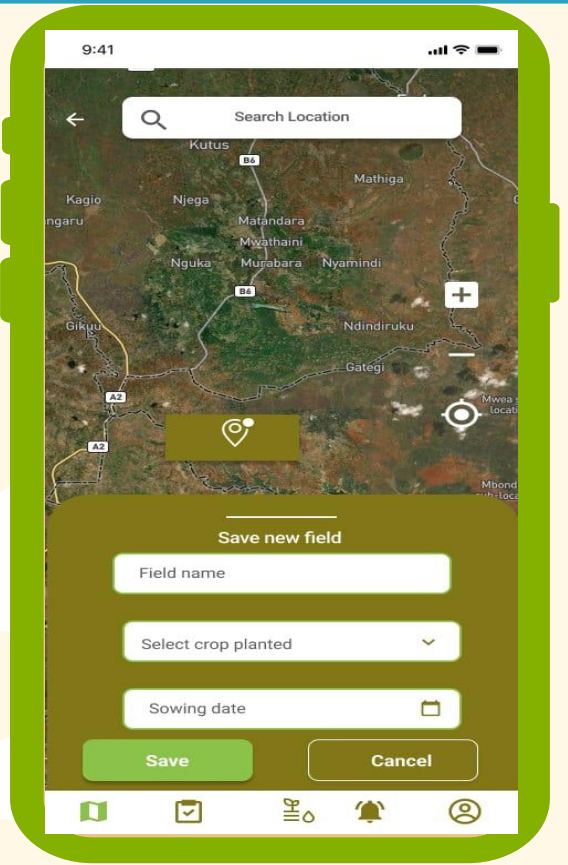

7

CHALLENGES

What problems have we faced so far?

CHALLENGES

- Clashing timelines of the project and normal semester activities such as examinations and classes, causing initial delay
- Delayed access to a PC with the required specifications
- Large scope of project. Farmers and experts have different needs that might merit the use of separate systems to satisfy these needs.
- Small scale farmers might not have as much use for satellite imagery as the experts.
- We lack firsthand knowledge on what will be useful to a farmer on the ground

8

ACKNOWLEDGEMENT

Our final thoughts

ACKNOWLEDGEMENT

- We wish to thank the Kenya Space Agency for funding the project, the University of JKUAT for hosting the project, and the student participants for the cooperation exercised so far.
- We look forward to developing the best product for the farmers and experts, and to work together in promoting food security and sustainability in our country Kenya.

THANK YOU!

Q&A