



JKUAT-KSA SMALL SCALE CROP MAPPING USING AI/ML

RESEARCH CHAIR 2021/2022– Midterm Review



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and the project lead

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Enhancing the development
of efficient farming and
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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.



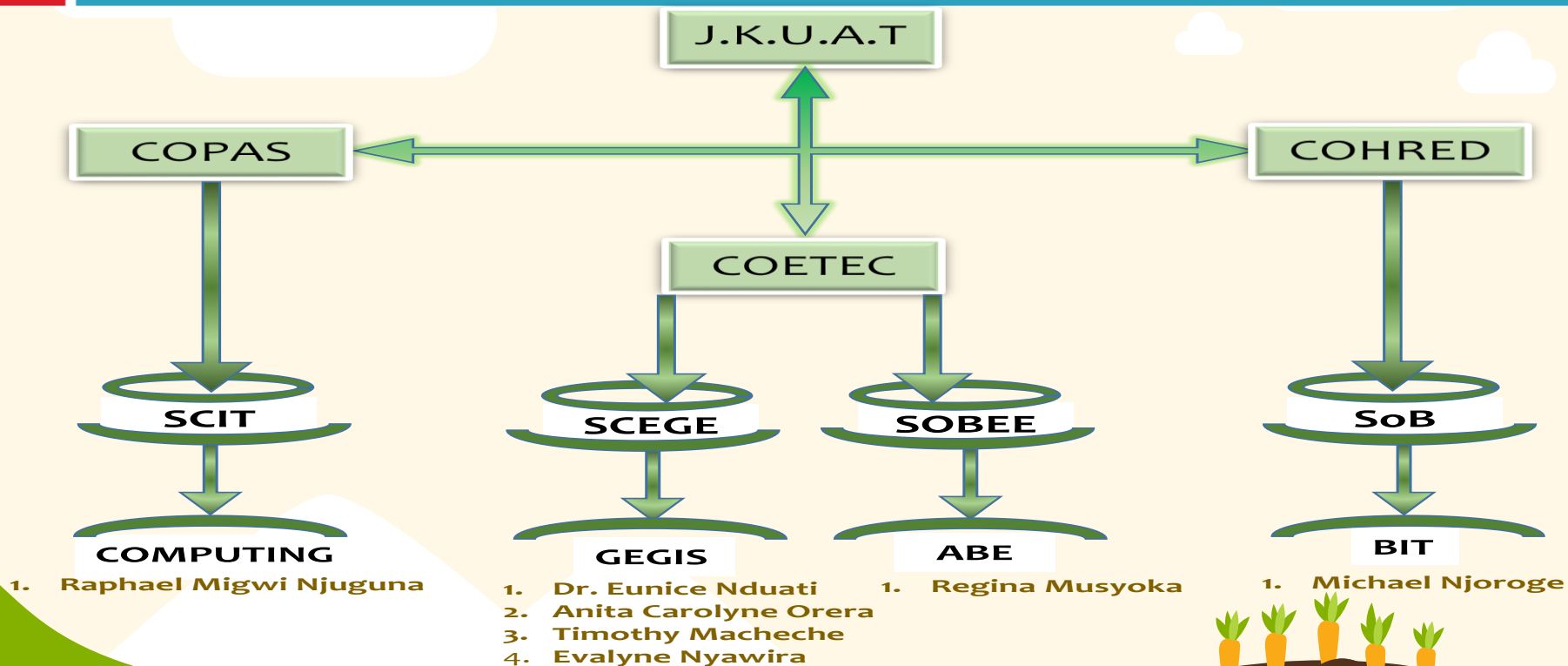
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PROJECT TEAM

A multi-disciplinary approach to problem solving



PROJECT TEAM



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.



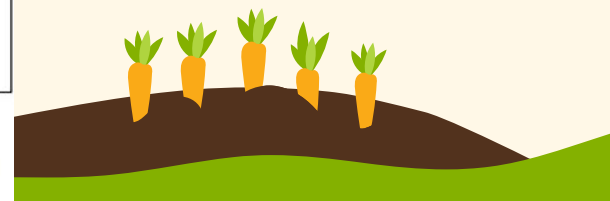
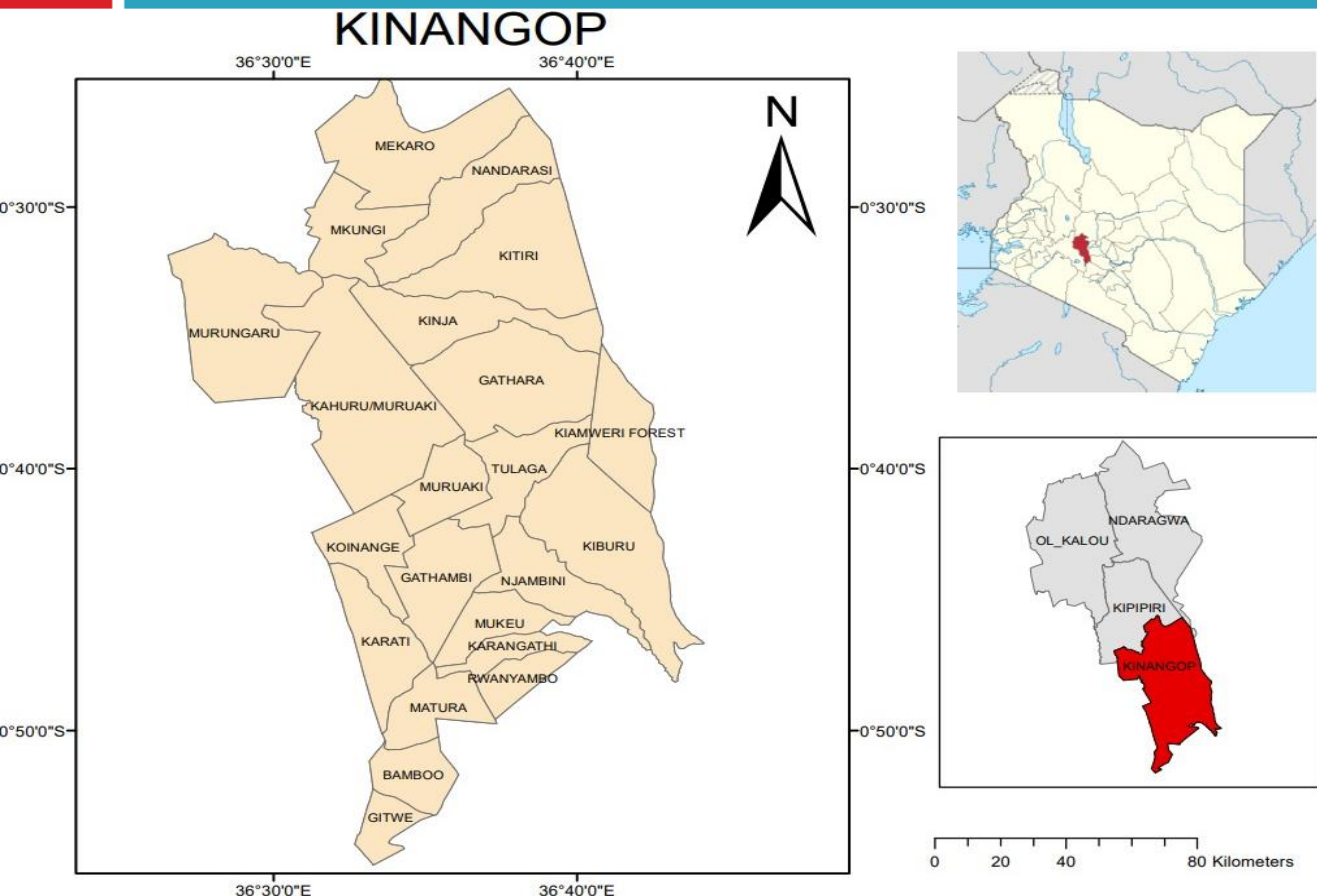
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AREA OF INTEREST (AOI)

Our chosen study area



STUDY AREA MAP



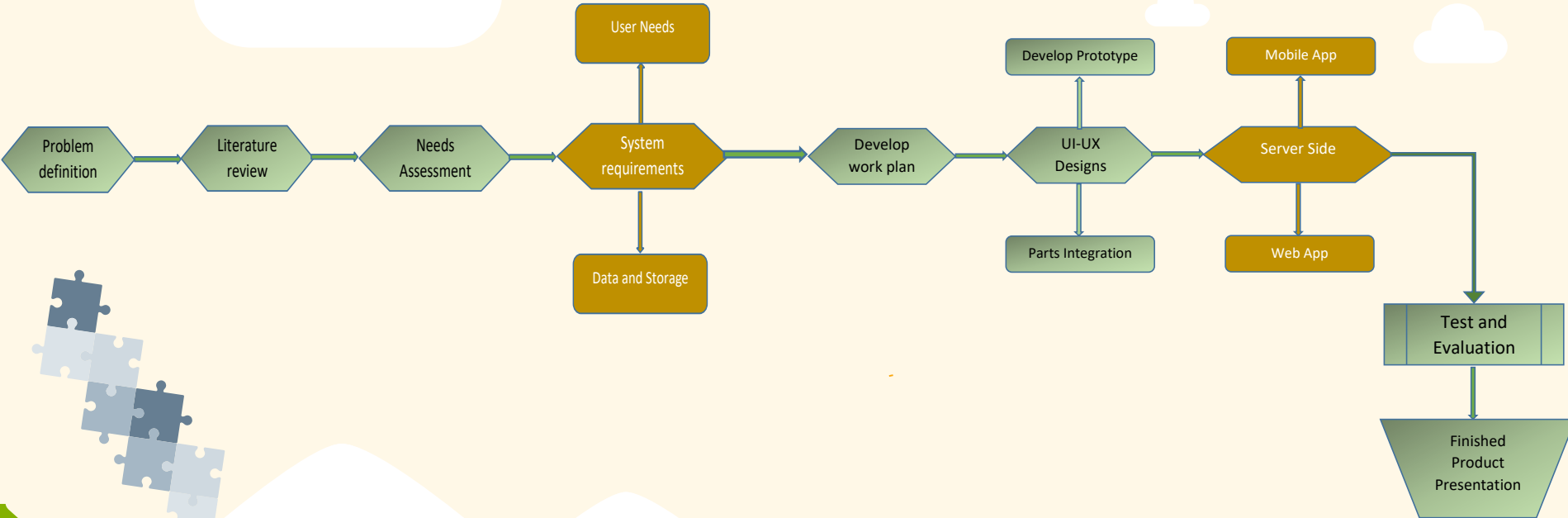
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METHODOLOGY

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



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RESULTS SECTION

What have we achieved so far?





GOOGLE EARTH ENGINE

The following indices have been calculated for Sentinel 2 MSI;

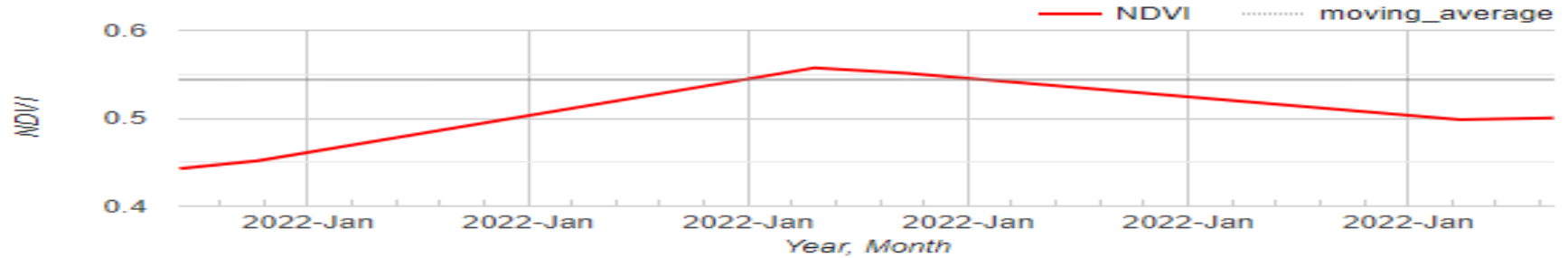
- ❖ NDVI (Normalized Difference Vegetation Index)
- ❖ MNDWI (Modified Normalized Difference water Index)
- ❖ SAVI (Soil Adjusted Vegetation Index)
- ❖ NDRE (Normalized Difference Red Edge)
- ❖ NDMI (Normalized Difference Moisture Index)

We are also keen on including ReCI 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;

Time Series:NDVI

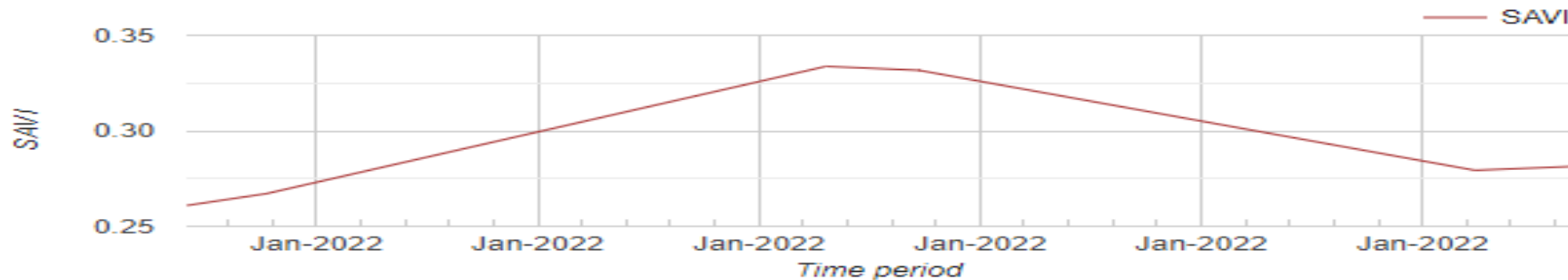


MNDWI Time Series

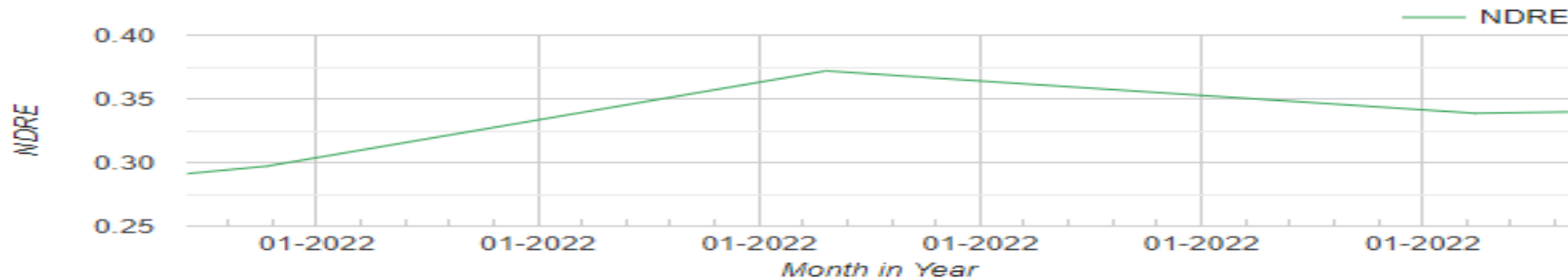


GOOGLE EARTH ENGINE

SAVI Time Series

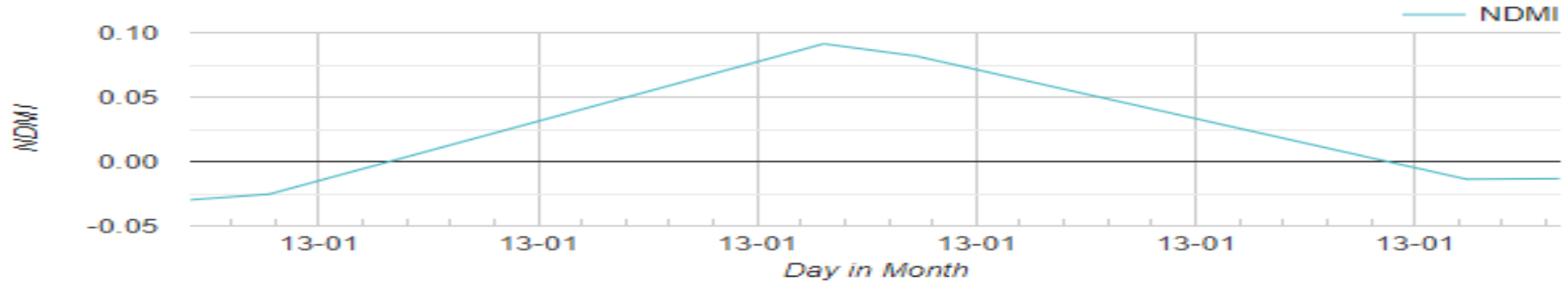


NDRE Time Series



GOOGLE EARTH ENGINE

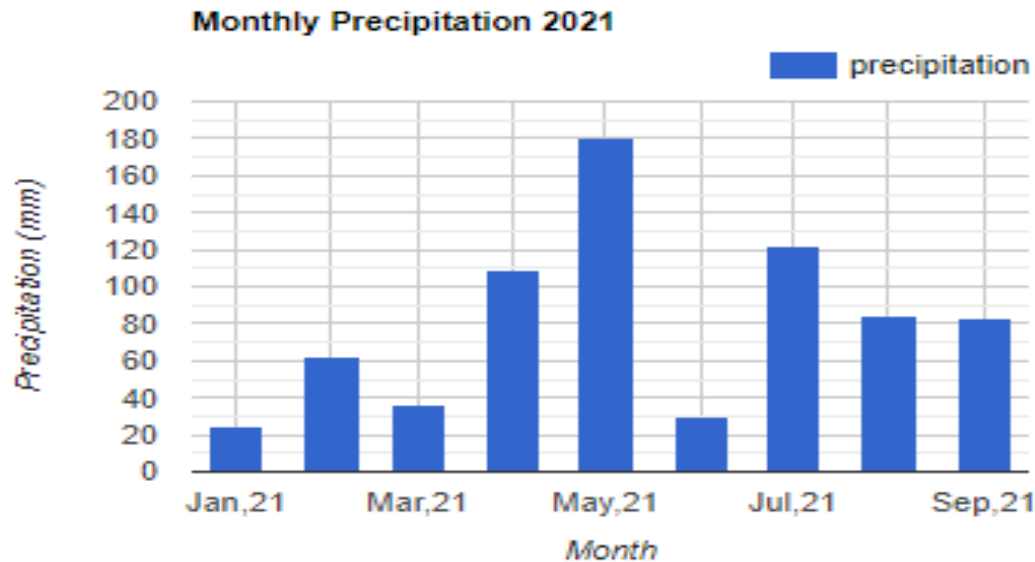
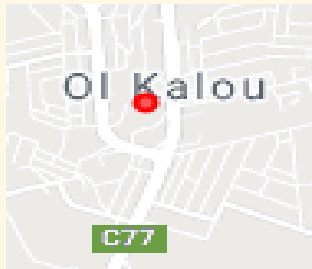
NDMI Time Series



- 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



CROMAP

Improving Farm Efficiencies

Create new Account

Already Registered? Log in [here](#).

NAME

Jiara Martins

EMAIL

hello@reallygreatsite.com

PHONE NUMBER

0712345678



CREATE PASSWORD

sign up

WEB APPLICATION



← **CROMAP** Improving Farm Efficiencies 

Search in CROMAP 

Monitor the health of your crops, predict yields, and daily weather forecast in CROMAP

[View Live Webpage](#)

Control pests, manage your fields and learn about best farming practices in CROMAP

[Get Started](#)





WEB APPLICATION



CROMAP

Improving Farm Efficiencies







Select Date

Add Field

Vegetation Index

Data Manager

Weather

Crop Manuals

Vegetation Map

My Collections

Settings

MOBILE APPLICATION

Sign In



Sign in with Google



Login with facebook

Login

New user? Register [here](#)



Myke Software

mykesoftware@gmail.com

Edit profile



switch theme



Contact us



Report a bug



Logout



General

Report




Save




MOBILE APP DASHBOARD AND UI

←

General Report

scouting date 


Field Info 


Client name


Field location

Field acres

Field coordinates

Select crop planted 




Sowing date 

Stage of growth 



Root thickness Root numbers

+ Add phase - Remove phase

Plant density


9:41   

←


Juja farm  

10.5 ha

39.5119° N 122.0711° W


Crop rotation 

Season 2022 Sowing date

Crop name 31/12/2021 


Growth stages + Harvesting date


12/04/2022

Current weather 

Jan 20,2022 12:00- 1:00






26°


Wind	Humidity	Clouds
3 m/s 	43 %	32%




Precipitation 0 mm 

New (0) closed (0)


+ Add New Task


    

Threats 

+ Add threat


Field review 






State of crops 

Yields

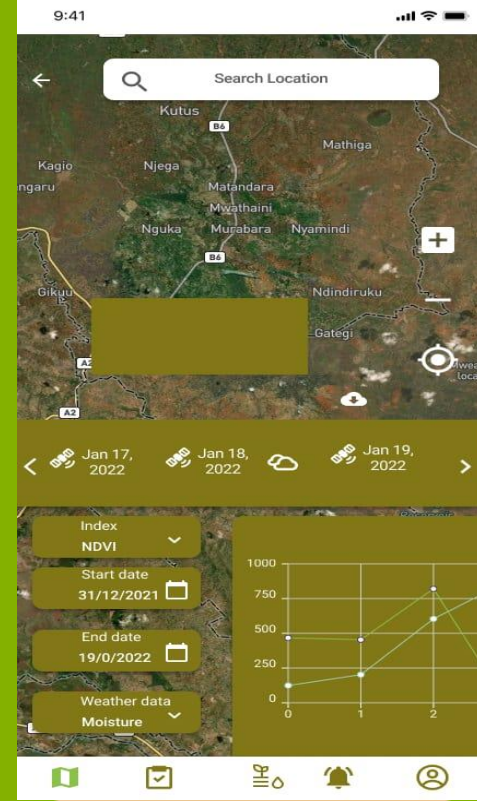
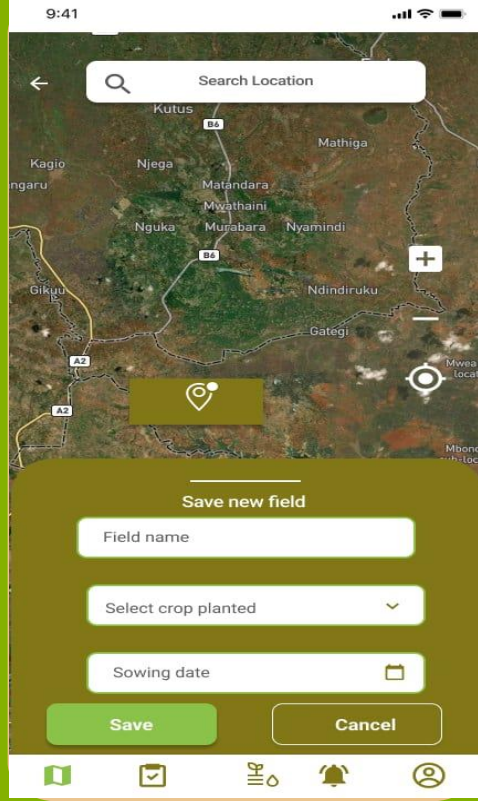
Moisture

Expert comment

 Save task

MOBILE APP DASHBOARD AND UI





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



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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

