

## Introduction

- Land and Crop type classification mapping is used to determine what is on the surface without having to physically go to a large study area
- Using ground truth data (samples), they are each grouped into representative classes
  - Samples are grouped by spectral reflectance (brightness of reflectance in specific spectral bands)
- Using machine learning and other algorithms, maps can be generated to estimate where crops are located over a large area
- Using various types of satellite images to calculate spectral reflectance of each ground truth sample is important for accurate results

## Project Goal

- To determine optimal remote sensing techniques and data for accurate crop and land cover maps
- Determine if crop classifications can be accurate with intercropped fields
- Mapping Crop type and Land type in developing countries like Malawi can be vital for areas that do not have access to crop inventory maps
- Providing accurate maps can be used to guide agricultural and environmental planning decision-making
  - These decisions are crucial for countries that suffer from chronic food insecurity
- Crop inventory maps can be a helpful tool for smallholder farmers in rural areas
  - Smallholder farms support food needs for 2/3 of rural communities around the world

## Study Area

- Located in the Mzimba district of Malawi Africa
- Study area is made up of many rural agriculture villages and 15 were chosen as control sites
- Study area is approx. 1600 Km Sq with each village having various numbers of samples

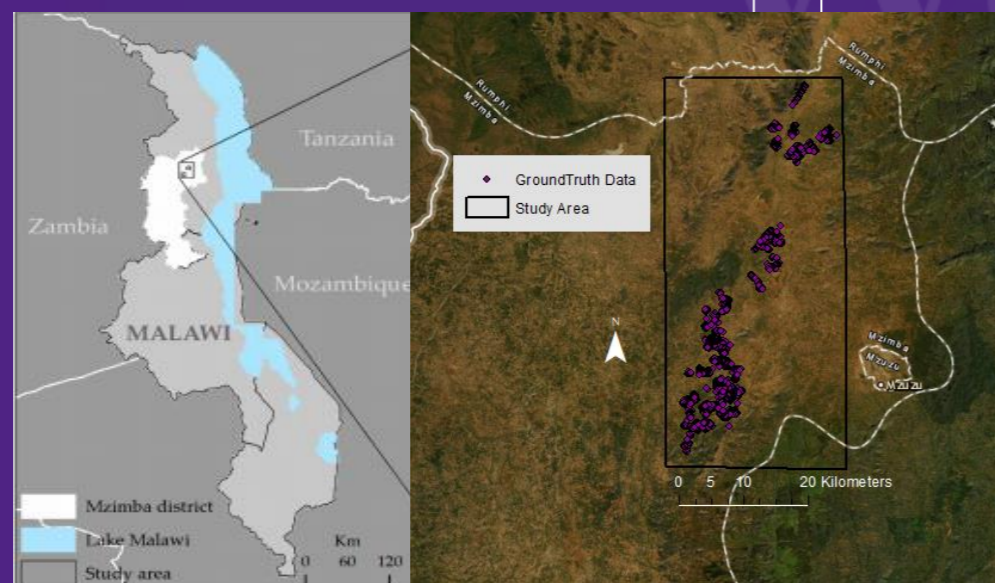


Figure 1: Malawi Study Site

## Data Acquisition

- Both optical satellite data (Sentinel-2 and PlanetScope) and radar data (Sentinel-1) were utilized
- Optical images were used for its high spatial resolution and high revisit frequency
- Radar images were helpful to fill temporal gaps using cloud penetration which optical data lacks

	Sentinel-1	Sentinel-2	PlanetScope
Resolution	5 × 20 m	10, 20, and 60 m	3-m
Band type	C-band	Coastal aerosol, Blue, Green, Red, NIR, and SWIR	Red, Green, Blue, and NIR
Revisit time	6 days	5 days	Daily
Orbit Height	693 km	786 km	475 km
Orbit inclination	98.18°	98.62°	~98°
Spectral range	3.75–7.5 cm	0.44–2.19 μm	0.45–0.67 μm

Table 1: Satellite Data Comparison

- Sentinel Images were acquired using ESA Copernicus a free open source collection of satellite images
- Preprocessing steps were used to improve accuracy and visibility of images for classification steps in the future
- Real colour and false colour composites were generated for the entire study area

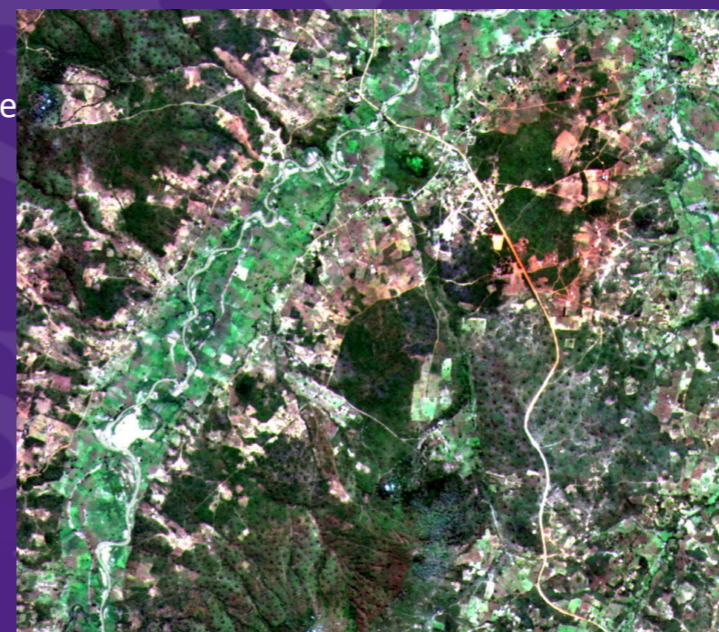


Figure 2: Thimalala Study site  
Real Colour Composite Image

## Ground Truth Samples

- Over 3000 samples were used from 15 different agriculture villages
- Data for each sample collected included Longitude, Latitude, Crop type, Mono/Inter crop, etc
- Having samples that are representative of the study area is used to ensure accuracy for classification results

## Classification Mapping

- Using over 3000 ground truth samples multiple crop type maps will be generated
- Over 20 different types of classes will be used with a variety of mono and intercropped groupings
- Monocropping classifications have shown highly accurate crop classification results

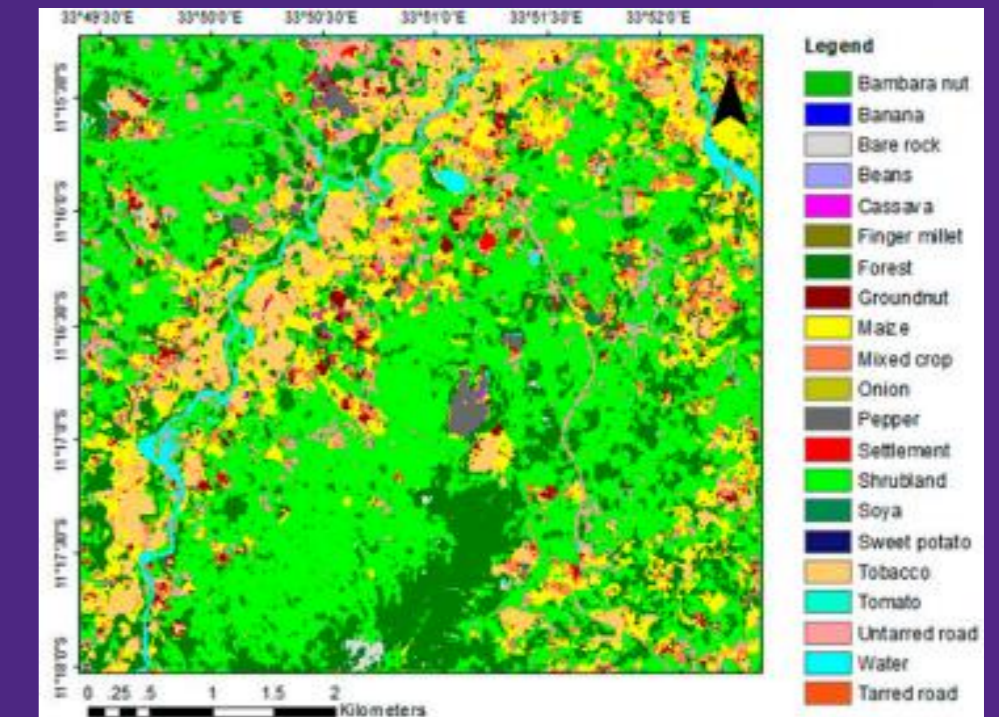


Figure 3: Thimalala Monocrop Classification Result

## Further Work

- Classifications for intercropped agriculture areas will be generated using various satellite data fusion methods
- Accuracy Assessments will be generated for each classification to determine if a reliable map was created
- Exploring other radar and optical satellite data that can be incorporated to provide higher accuracy maps

## References

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