

Mapping Crop Types and Cropping Systems in Nigeria with Sentinel-2 Imagery

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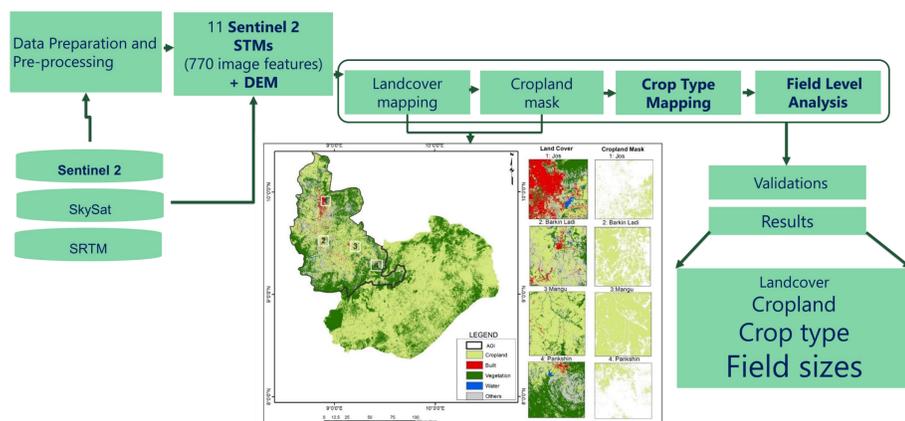
Background

Crop type mapping in smallholder settings in Africa is complex, given the irregular field patterns and small field sizes, diverse management practices including intercropping, and highly heterogeneous growing environments. Frequent cloud cover during the growing season renders crop type mapping a challenging exercise. However, freely available satellite data of the European Copernicus Program, specifically Sentinel 2A/B, allow for major advances in mapping and monitoring crop types in smallholder farming systems of Africa.

Research objectives

- Expand existing crop type mapping methodologies to map maize and potato, as well as intercropping mixtures with both crops, using S2 data only.
- Assess crop types distributed across gradients of field sizes

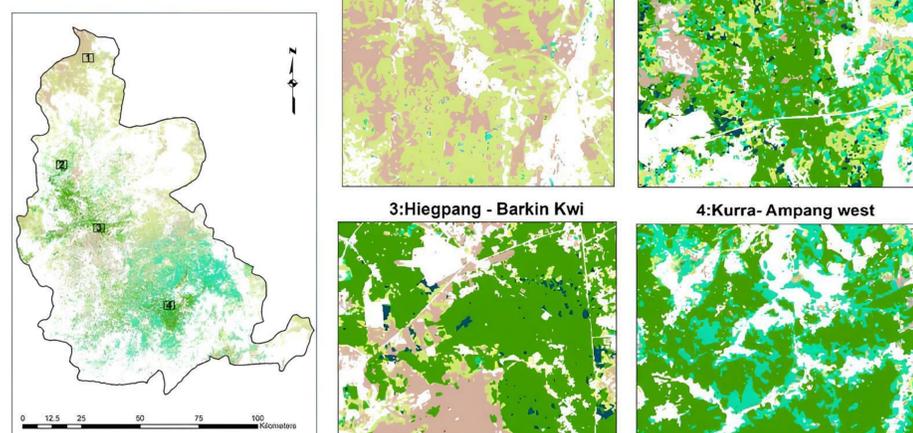
Data and methodology



Crop type map of the heterogeneous Jos Plateau, Nigeria

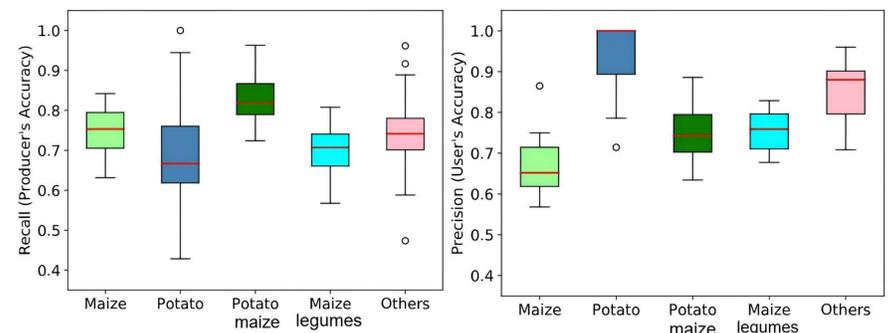
Class	Coverage
Maize	51.2%
Potato	1%
Potato-Maize	17.5%
Maize-Legumes	30.3%
Others	

48% (intercropped)

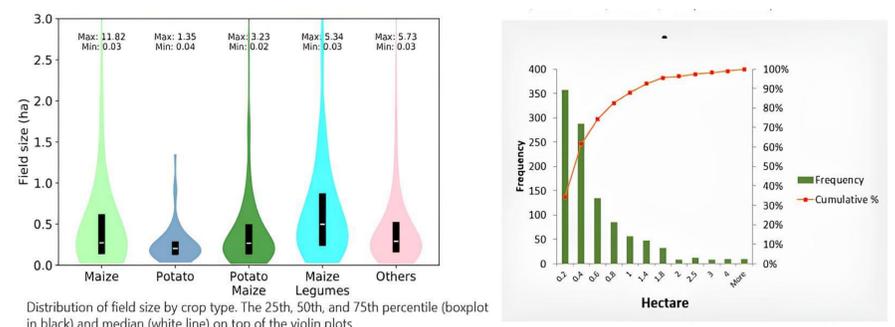


Class 'Others' = fonio, vegetables, grasses, rice and yam

Accuracy assessment



Field size assessment



Distribution of field size by crop type. The 25th, 50th, and 75th percentile (boxplot in black) and median (white line) on top of the violin plots

Key findings

- Accuracy: limited by quantity and spatial distribution of reference data, spectral similarity of the mapped classes, presence of pests and diseases, poor management practices, the frequency and quality of available satellite data
- Intercropping region covered up to 48% of the mapped classes
- Over 60% and 30% of the fields are below 0.4 ha and 0.2 ha, respectively
- Field sizes are influenced by crop types, potato-related classes are the smallest fields

Conclusion

- Mapping mono and intercropped classes in complex smallholder regions of Africa is feasible with Sentinel 2 spectral data.
- Our crop mapping approach achieved accuracy comparable with studies that had a narrower focus.
- We are convinced that this is a crucial first step to better comprehend the opportunities and limitations regarding the use of S2 data for monitoring smallholder cropping systems in Africa.

