

Identifying smallholder farmers' crop management practices with remote sensing to support crop diversification with legumes

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Spotlight on legume cultivation in smallholder farming systems

- Lack of information on crop production in smallholder farming systems limits **food security assessments**.
- Legume** cropping practices are not well known and are **highly heterogeneous**.
- Open-source **remote sensing** data with **high spatiotemporal resolution** is available.

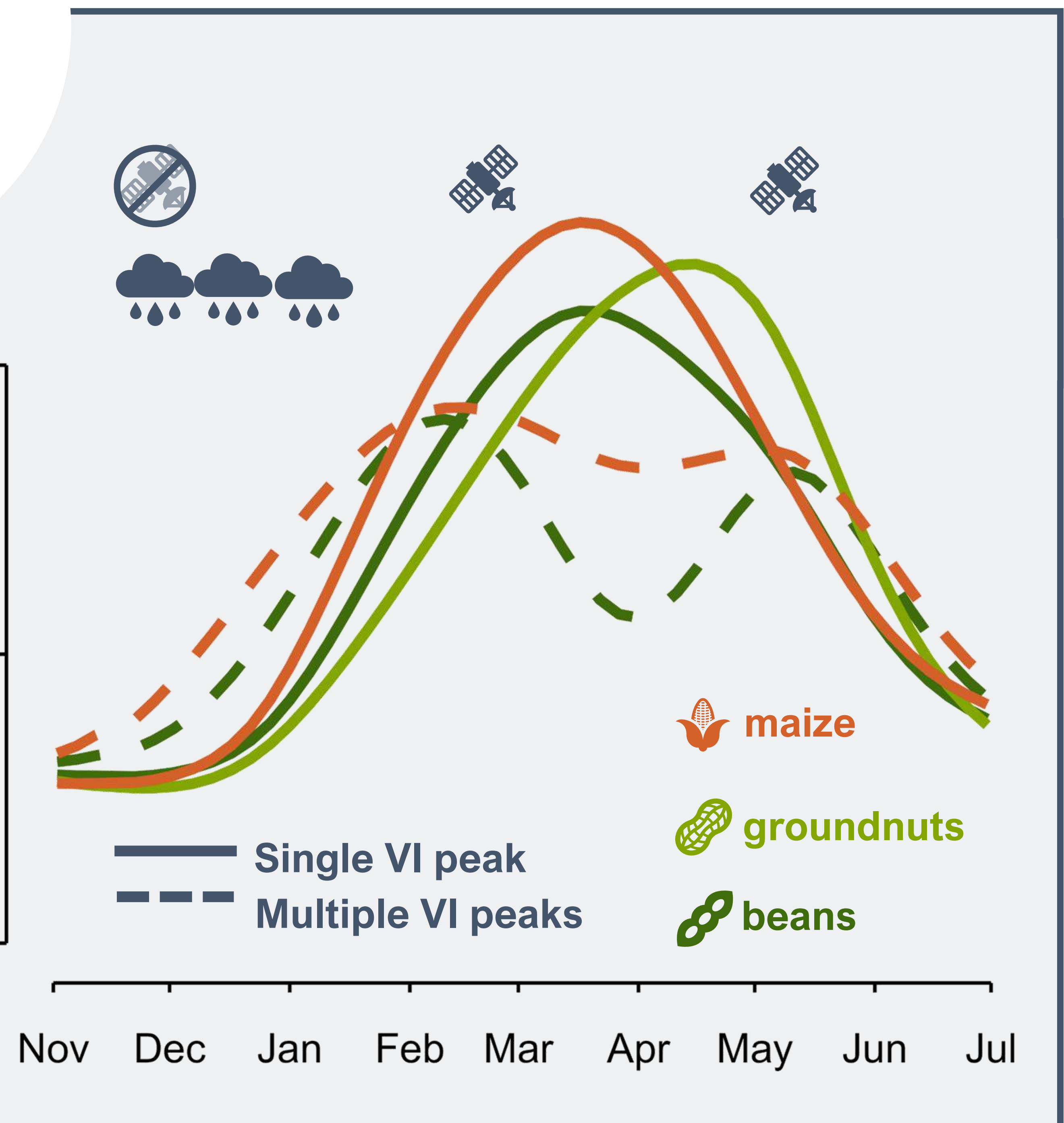


Using remote sensing to track legumes cultivation?

How can time series of remotely sensed vegetation indices (VIs) help describe and identify diverse management practices in maize-legume farming systems?

Peaks of vegetation index characterize crop planting strategies

- Rapid field survey**, n = 6000 fields in Songwe region, **Tanzania**
Retrieval of **field shapes** with GPS
- Extraction of field-level **Enhanced VI** from **Sentinel-2**
10m pixel size, revisit rate every 5 days
Cloud removal and interpolation of missing images
- Phenology analysis** to get **planting dates**, **vegetation peak**, and **harvesting times** to distinguish planting strategy (peaks)
- Classification of **crop × planting strategy** classes with dates (normalized to the start of the rain) and VI based predictors



Prediction accuracy is moderate

- Beans**: 45%
- Groundnuts**: 55%
- Maize**: 77%

Take-aways

- Diverse cropping patterns were detected from the EVI time series:
 - Single cropping** planted with first rains
 - Double cropping** or single cropping planted **mid-season**
 - Single cropping** planted with first rains
 - Early planting and harvest** followed by unknown crop or fallow
- Heterogeneous** fields, crop EVI similarities, **long cultivation windows** and **clouds** limits prediction but there is room for improvement! **Cross-year testing** is needed to assess the possibility to **trace back rotation** at the field level.
- Making the most of rapid-survey data** by complementing observation with dynamic remote sensing observations allows for a better characterization of cropping practices and **generate information rapidly in data scarce environment**.

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