

Integration of open-source solutions with deep learning for estimating crop production in data-scarce smallholder farming areas



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In Ethiopia, smallholder farming contributes significant food production, almost 72% of the income from crop

Accurate & timely crop production information is very crucial for many applications

Sample survey approach is mostly constrained by:

- Resource, time, geographic coverage
- Hard to undertake frequently

Earth observation has provided possibility of monitoring and mapping of objects

Smallholder farming landscapes are mostly

- Fragmented, small and irregular
- Mixed cropping
- Irregular seasonality of crops

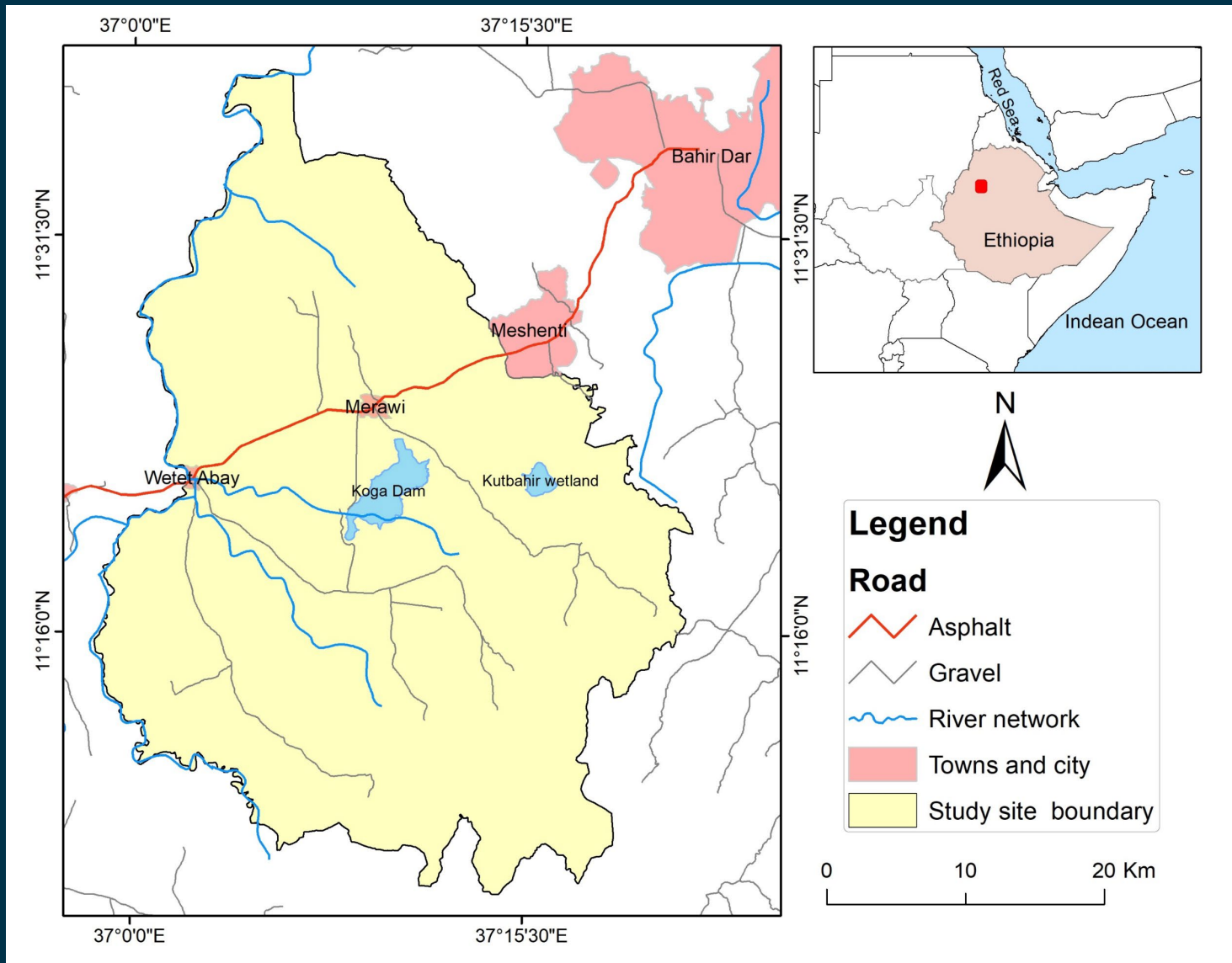
Cloud as a challenge during the growing season to map crops

Integrate multi-temporal multi-source optical and radar imagery with

artificial intelligence (deep net models) and

statistical tools to map crop types and estimate crop production





- Situated in north-western part of Ethiopia
- Dominated by smallholder farming system
- Small scale irrigation schemes in dry season
- One extended rainy season extends from **May to October** and
- Maize and Teff are dominant crops

Field data

Sentinel-1
TerraSAR-X

Sentinel-2
Planet Scope

Pre-processing
Spectral and backscatter
profiles, Vegetation
indices and polarimetric
features

PDOK, USDA CDL

Transfer learning

Data fusion

Deep Recurrent
Neural Nets

Baseline: twDTW,
Random forest

Crop land extent

Test site scale crop
production estimation

Regression based
crop yield estimation

Crop type map

Crop production

Overall geo-processing will be done fully using open source tools

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