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

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Scientific Background and Objectives

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 objec

Smallholder farming landscapes are mostly

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

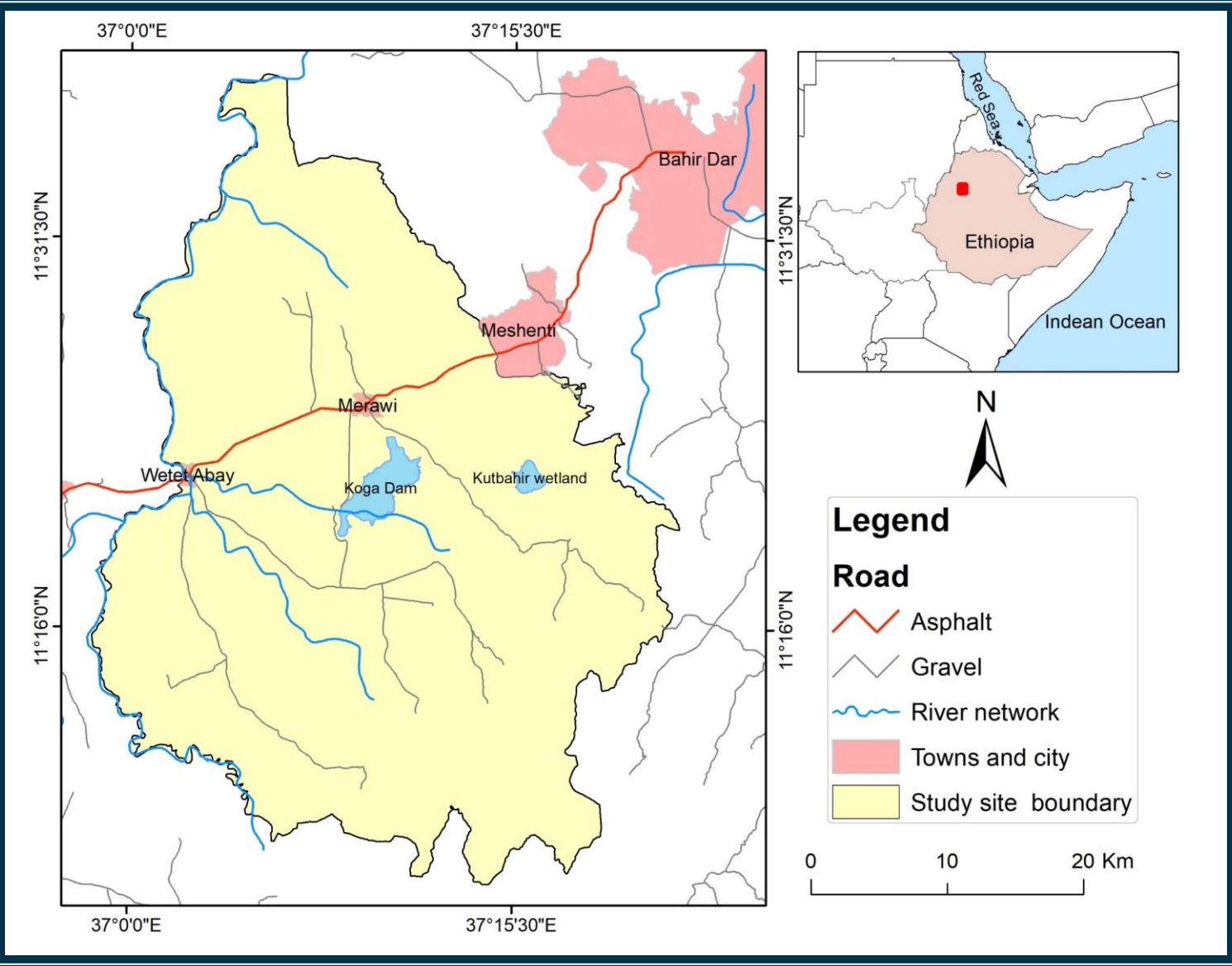
Cloud as a challenge during the growing season to map crops

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

Study Area



- 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

Research Outline

Field data

Sentinel-1
TerraSAR-X

Sentinel-2
Planet Scope

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

Crop land extent

PDOK, USDA CDL

Transfer learning

Data fusion

Deep Recurrent Neural Nets

Baseline: twDTW, Random forest

Crop type map

Test site scale crop production estimation

Regression based crop yield estimation

Crop production

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

Project Team

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