

# Remote Sensing for large-scale agricultural investment areas in Ethiopia – agricultural monitoring based on Earth observation time-series

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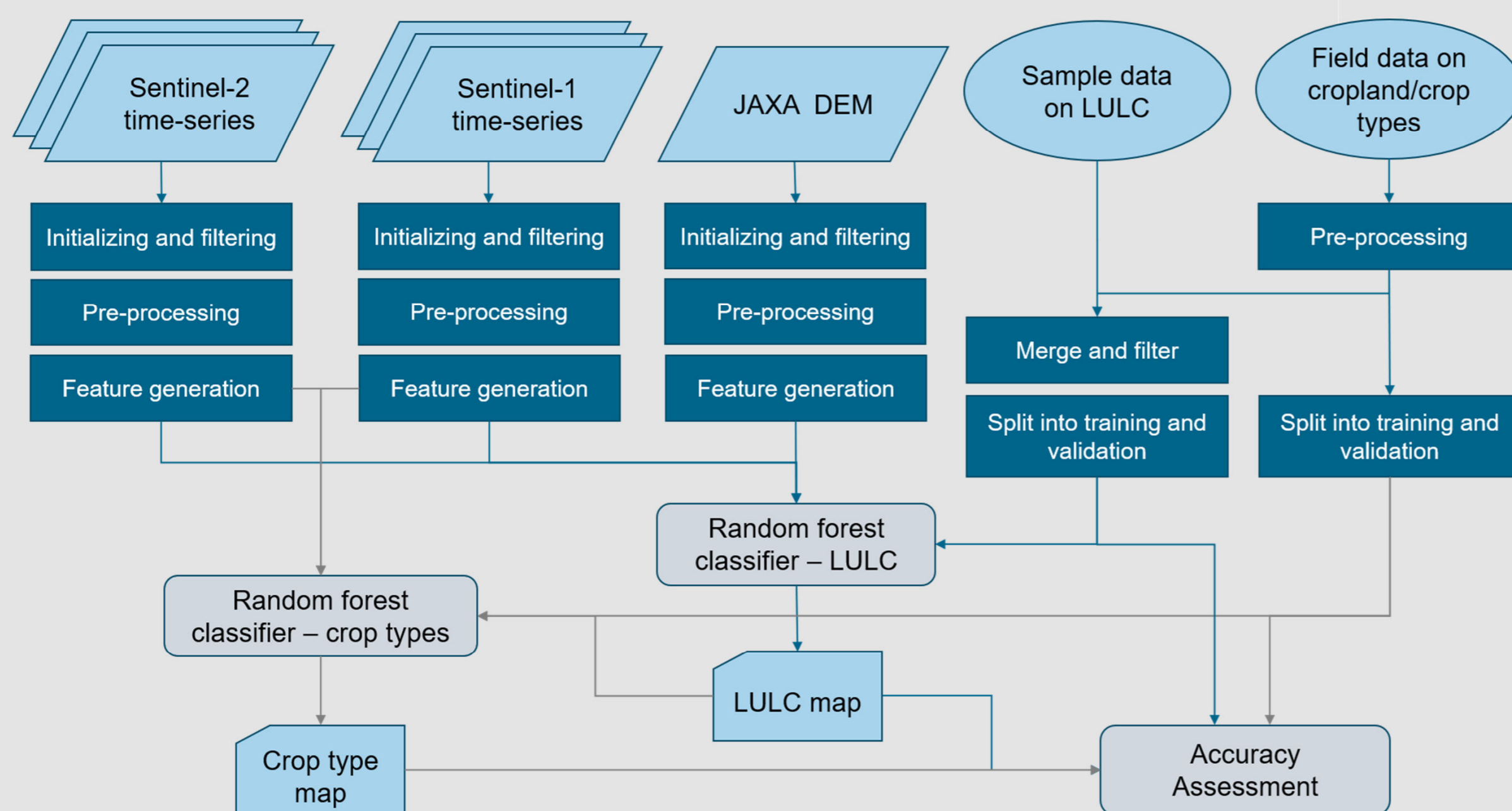
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## Introduction

Ethiopia is known to be currently food insecure and suffering from considerable food deficits. Therefore, Ethiopia has been promoting large-scale agricultural investment (LSAI) to transform the agricultural sector. However, the progress by agricultural development has been limited and there is a great need for monitoring of the implementation and actual state of land use of every LSAI project. In this study, remote sensing methods have been developed to improve and support agricultural monitoring in Ethiopia.

## Methodology

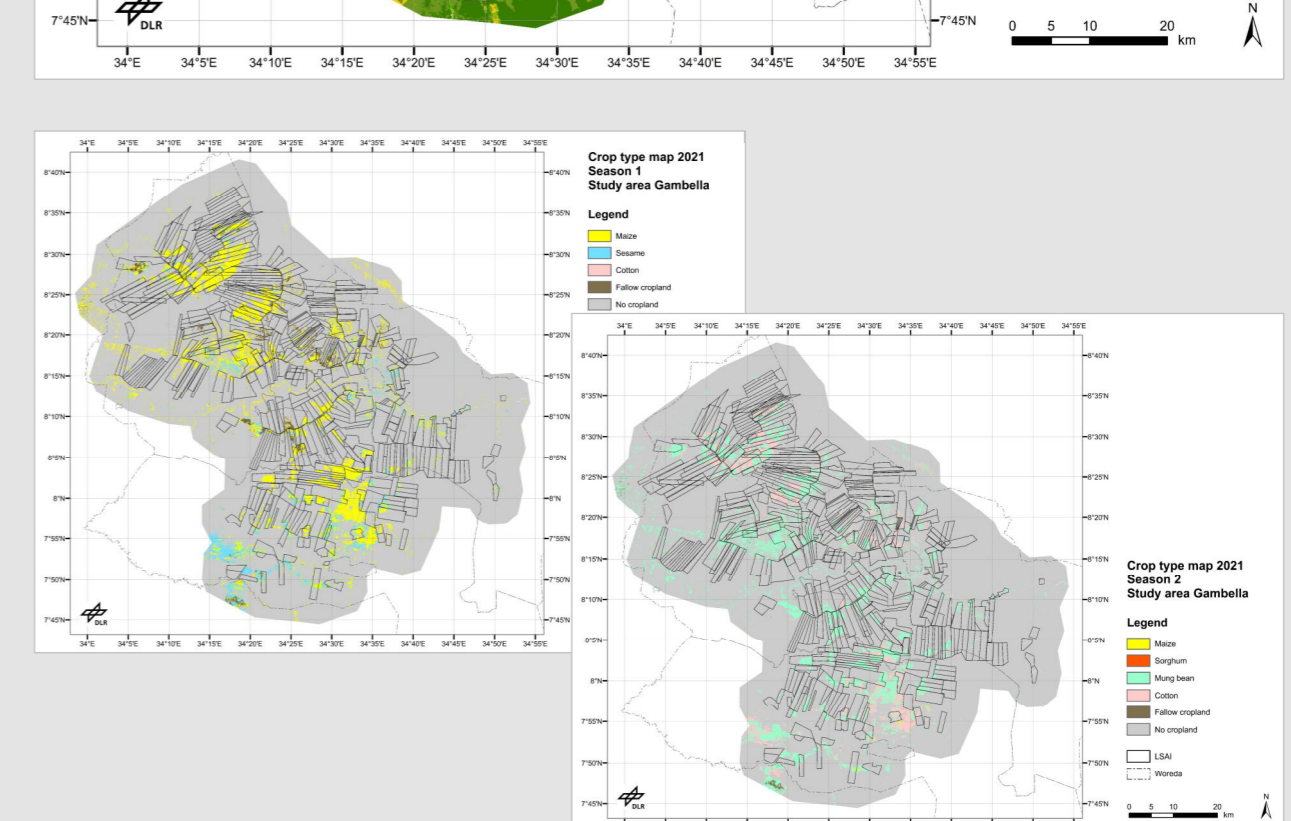
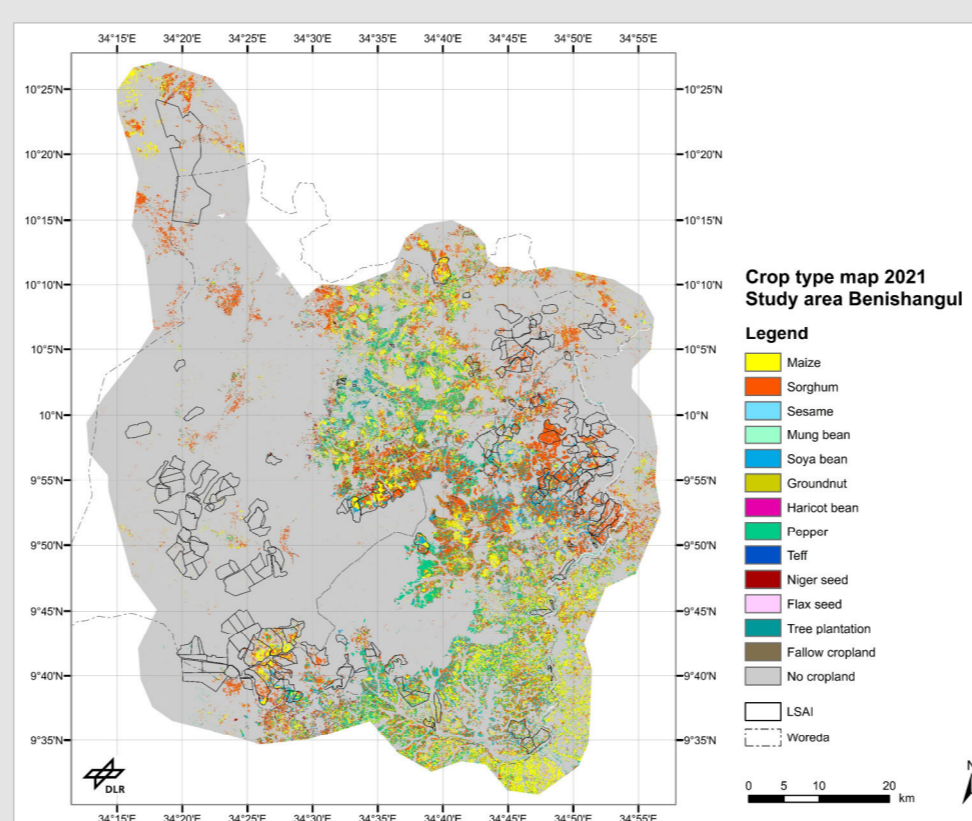
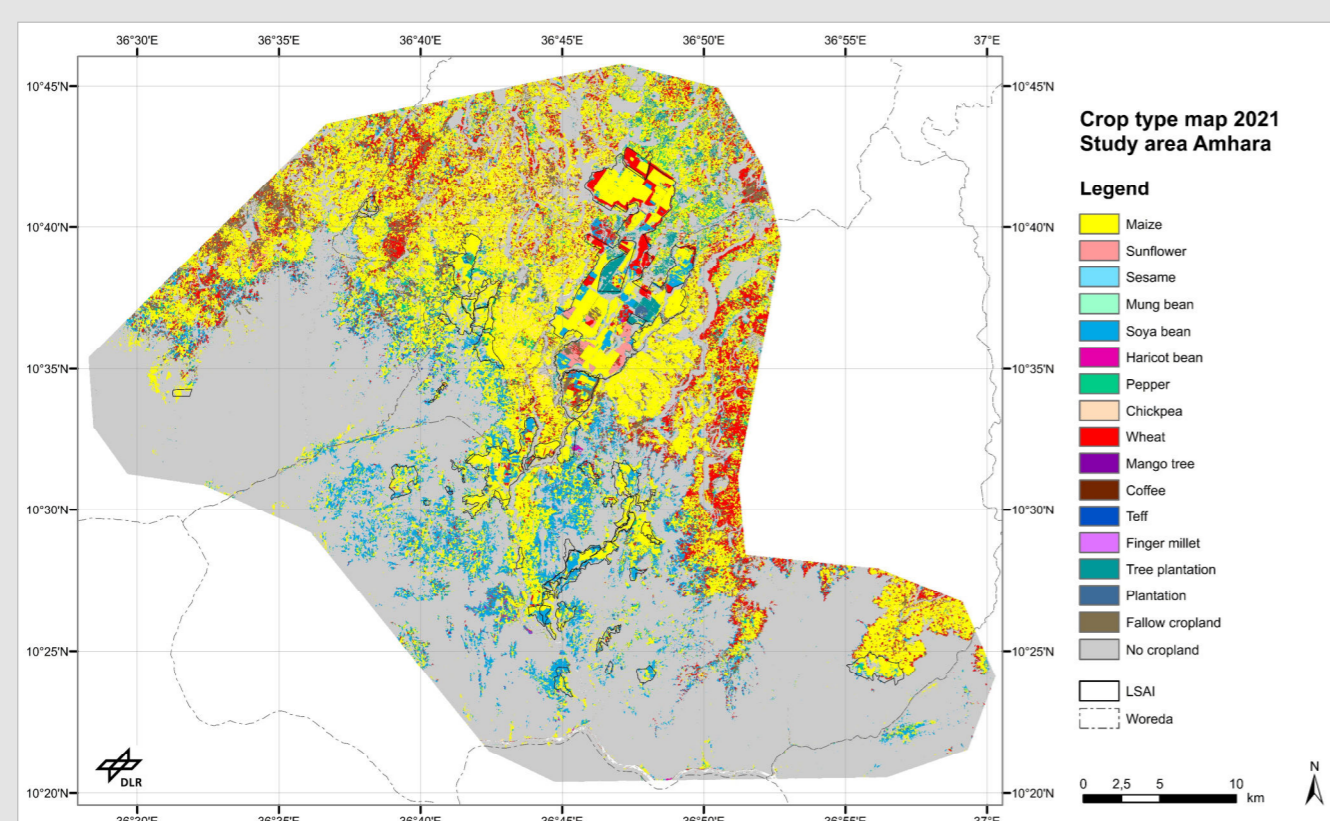
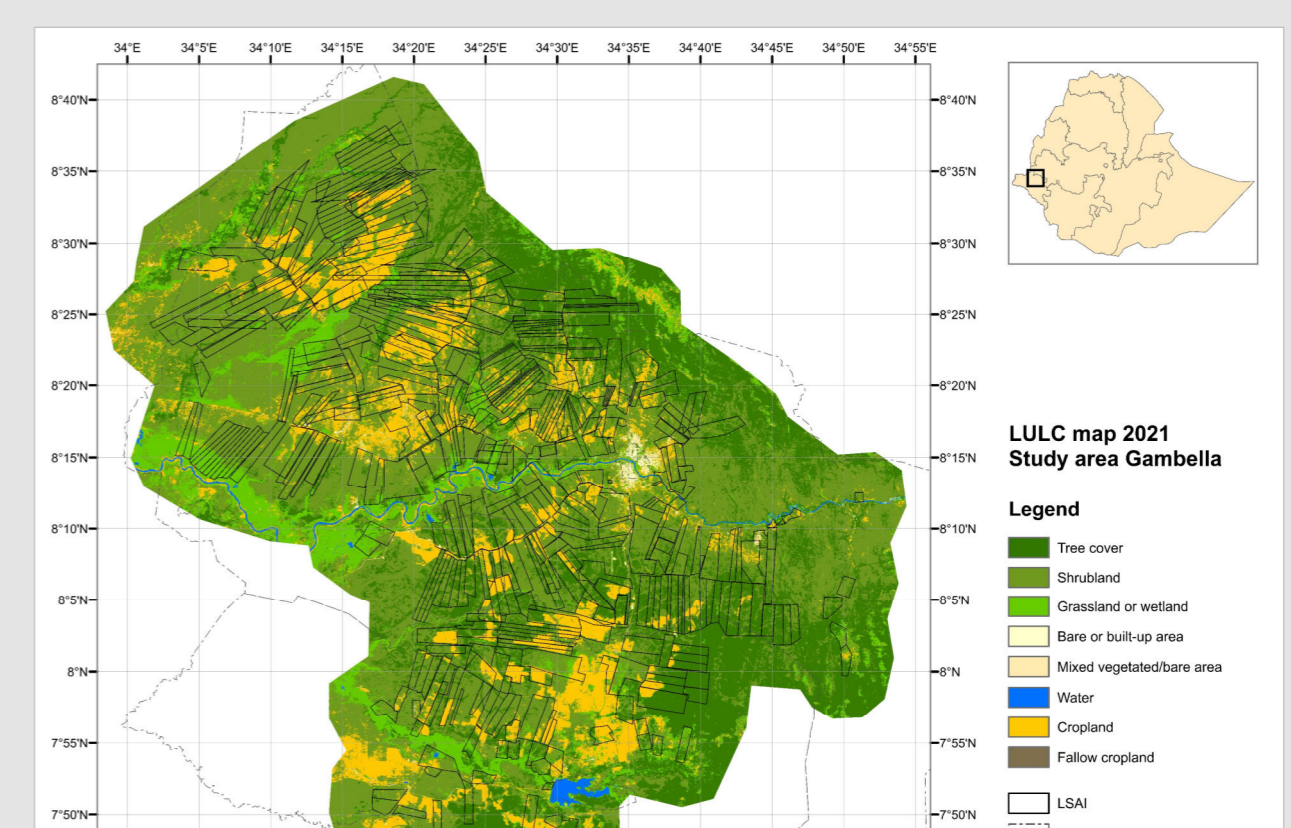
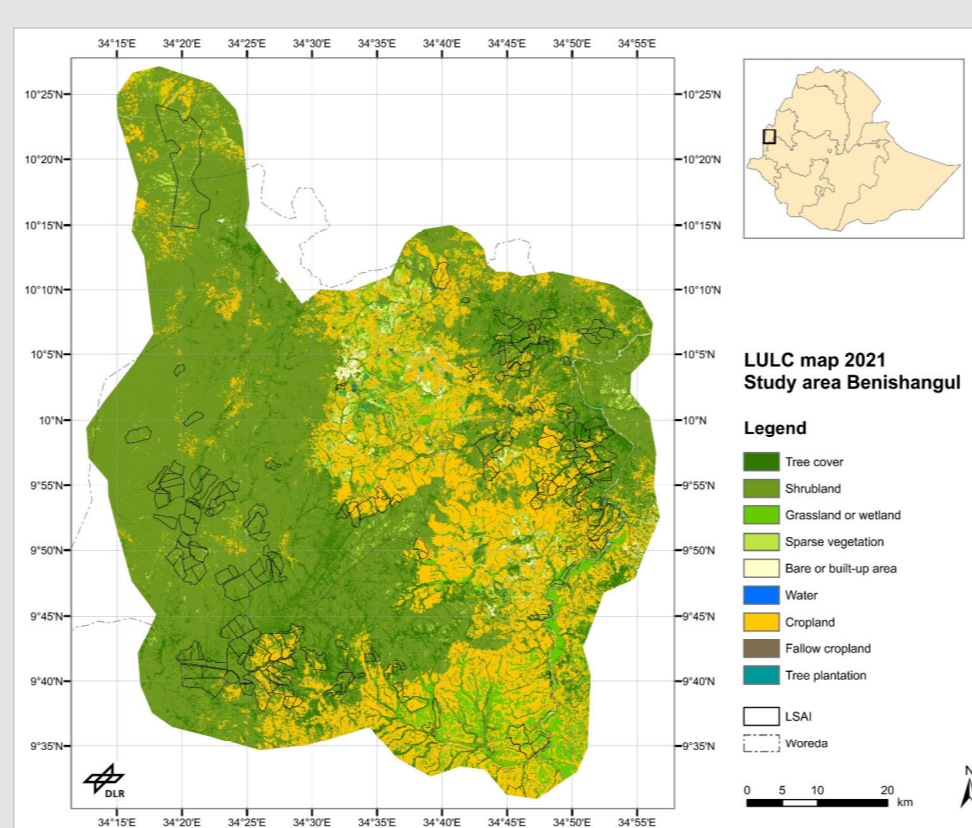
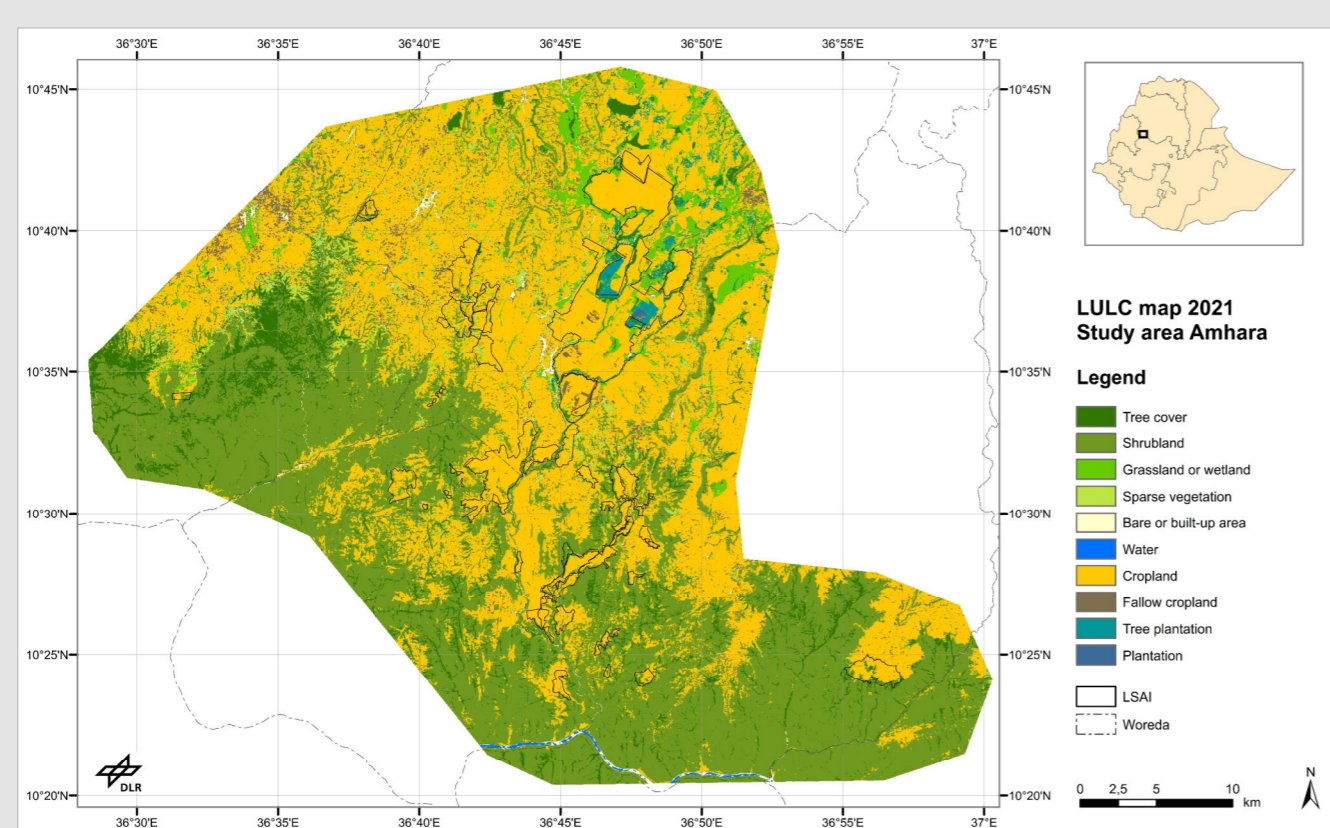
Earth observation data time series are analysed to examine the land used for agricultural production and to differentiate crop types grown within the three study areas. Current land use/land cover (LULC) is derived using Sentinel-2 and Sentinel-1 time series and additional digital elevation model (DEM) data to identify cropland areas. In a second step, time-series of Sentinel-1 and Sentinel-2 are used to differentiate among 20 different crop types grown in the regions. Supervised classification based on field data on crop types and sample data on LULC is performed by training and applying random forest classifiers using selected spectral and temporal metrics. A cloud processing environment (Google Earth Engine, GEE) was chosen to allow for usage of the classification procedure by regional experts without the need for own large computational power and software.



Classification workflow for LULC and crop type classification using GEE applied within this study

## Project results

The developed classification methods have been applied to derive information products for three study regions in Ethiopia including the LSAI areas within the provinces of Amhara, Benishangul, and Gambella. The methods and derived information products are made available to GIZ and regional experts to contribute to the development of more effective and efficient monitoring for agricultural investment areas in Ethiopia. The project RS4AIM (Remote Sensing for large-scale Agricultural Investment Monitoring in Ethiopia) and its follow-up RS4AIM-2 are complementing ongoing initiatives aiming at improved effectiveness and efficiency of Ethiopian land management interventions.



Amhara study area LULC classification (above) and crop type classification (below) for 2021

Benishangul study area LULC classification and crop type classification for 2021

Gambella study area LULC classification and crop type classifications for two growing periods in 2021