

Tools for information to farmers on grasslands yields under stressed conditions to support management practices

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Introduction

The main objective of GrasSat project is a fully operational system in form of desktop and mobile application, which provides a complementary tool for managing grassland production, mainly for medium and large farms in Poland and Norway. Combining the effectiveness of the application with the support of external advisors is the key to improve grass production management. Experience of the team of remote sensing and grassland specialists will be the firm foundation of the tools to be prepared within the project.

Study area



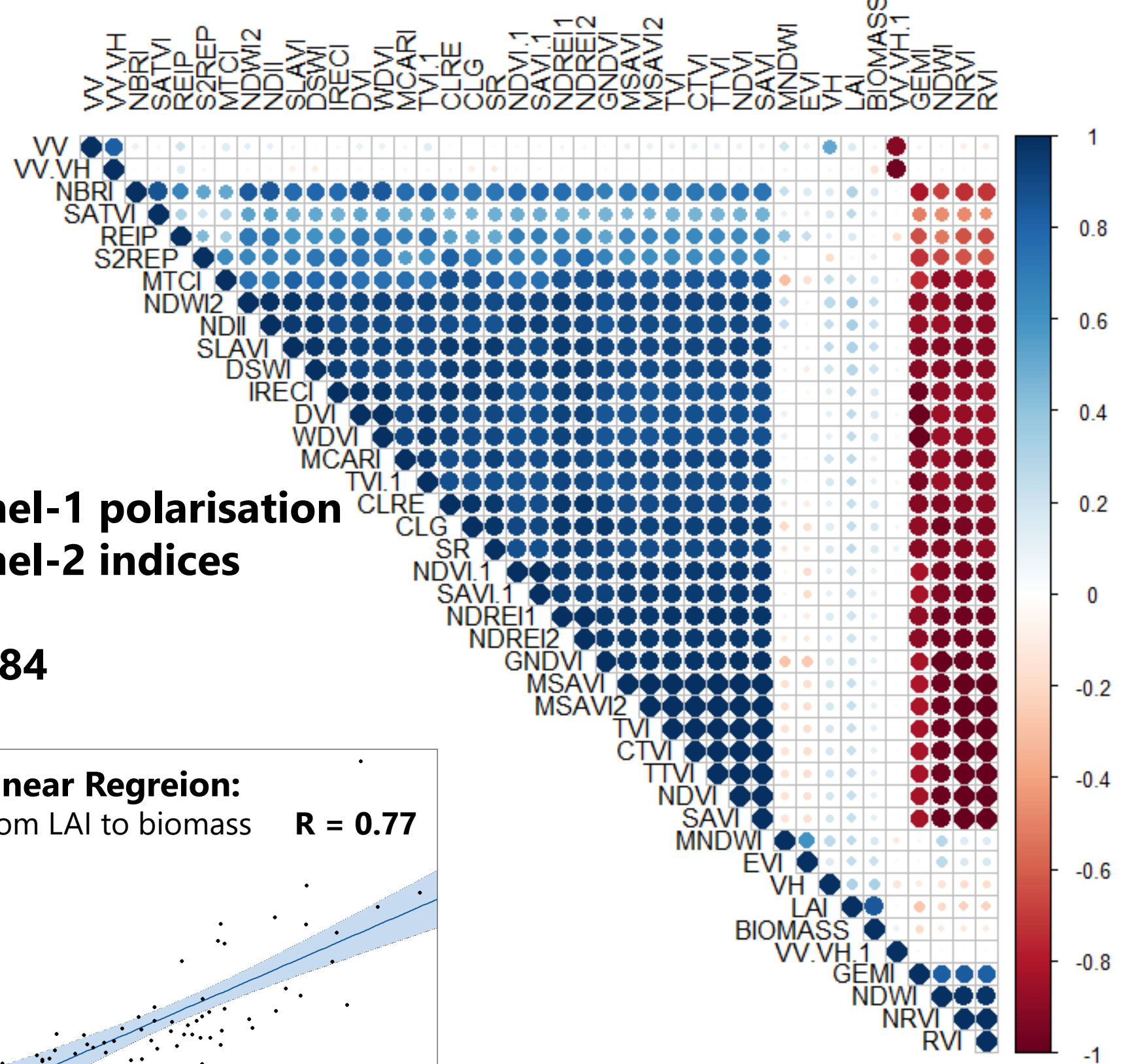
Location of test sites in Poland and Norway

In-situ measurements:

- LAI (LAI-2200C)
- APAR (AccuPAR)
- Chlorophyll (CCI)
- Soil moisture (PICO-64)
- Soil electrical conductivity
- Biomass (cutting)
- Platemeter
- Photo, metadata
- Spectral responses by the ASD FieldSpec 4 Hi-Res
- Radiation temperature

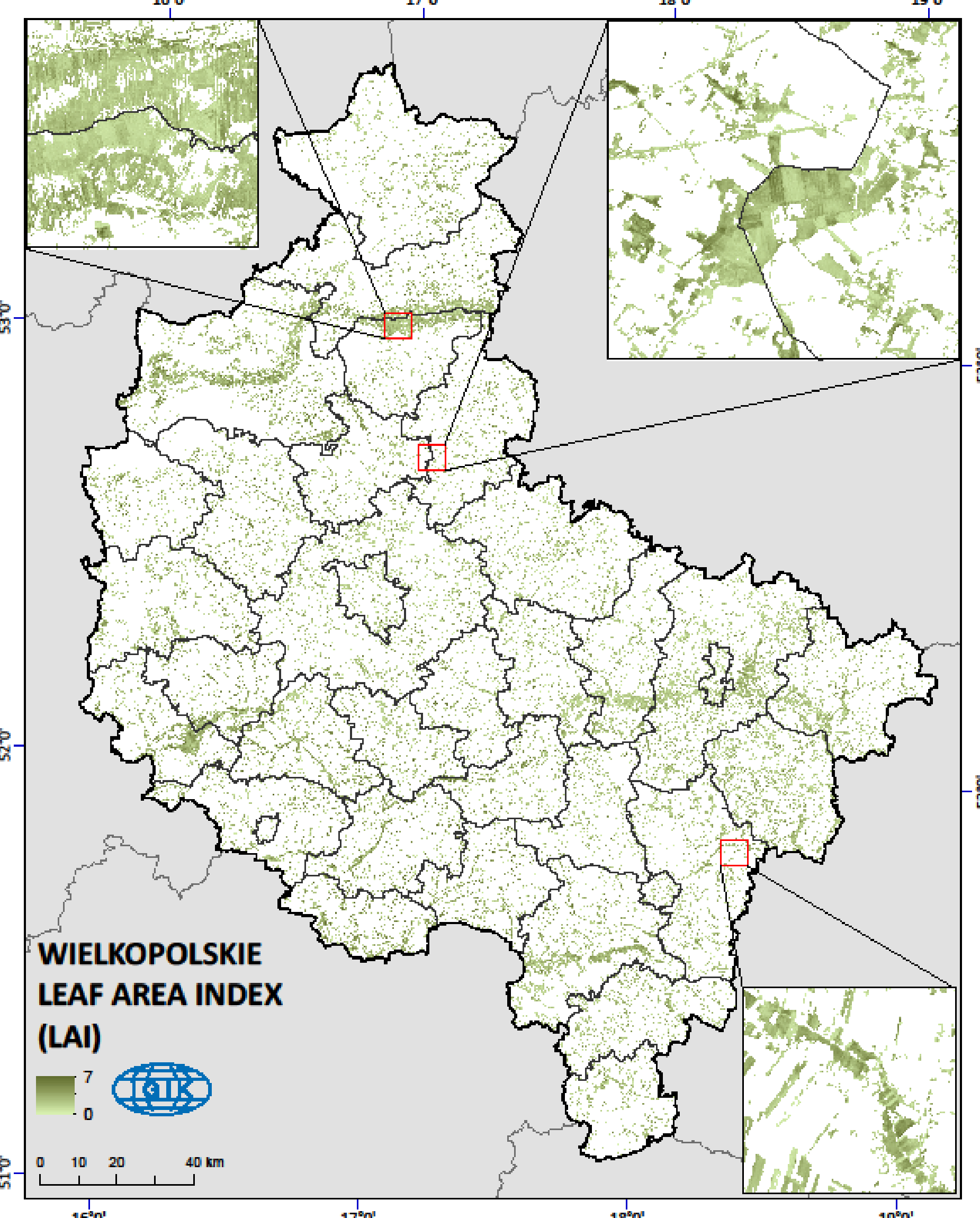
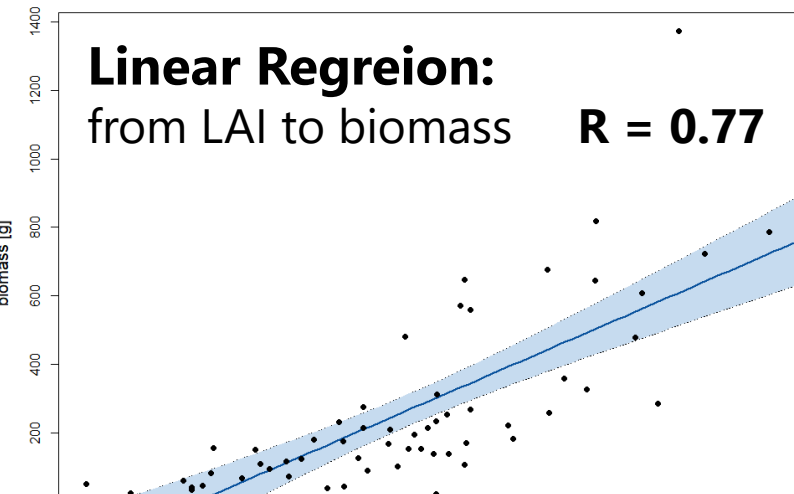
Example of analysed field: in-situ and by satellite imaging

Multiple Linear Regression for LAI modelling

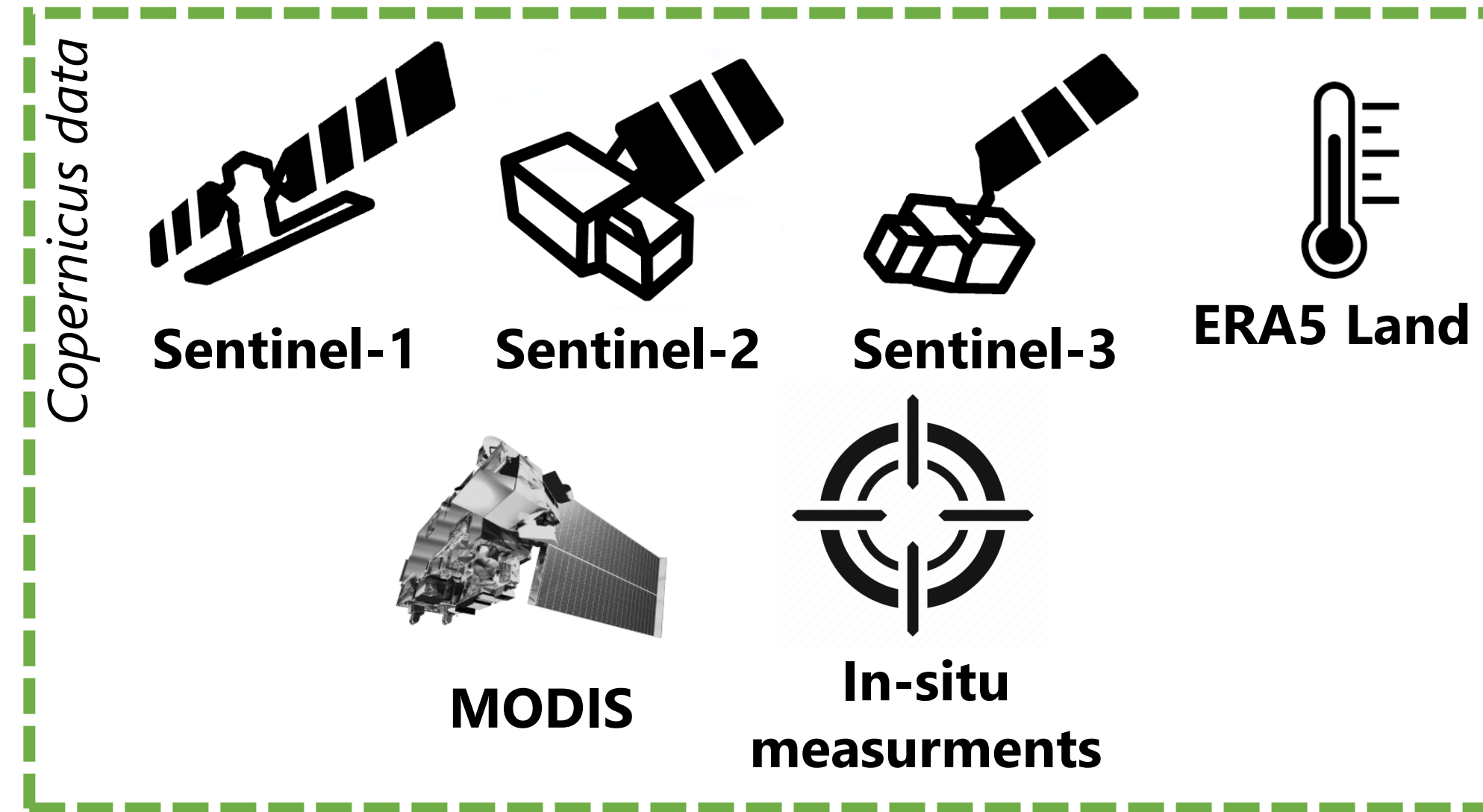


Sentinel-1 polarisation Sentinel-2 indices

R = 0.84



EO data



The outputs of the EO data processing are:

- yield predictions (fresh biomass) and LAI,
- grassland classifications
- soil moisture maps
- thermal and drought hazards,
- freezing risks
- remaining water in fields
- detection of pests and diseases
- detection of cuttings dates for meadows
- agro-meteorological conditions

Two indices calculated from Terra MODIS data as the **Temperature Condition Index (TCI)** and **Vegetation Condition Index (VCI)** will be applied to describe actual towards historical grasslands conditions and the deduction of drought.

Seasonal changes of TCI and VCI from April to June 2020

Potential risk of frost damage for selected field

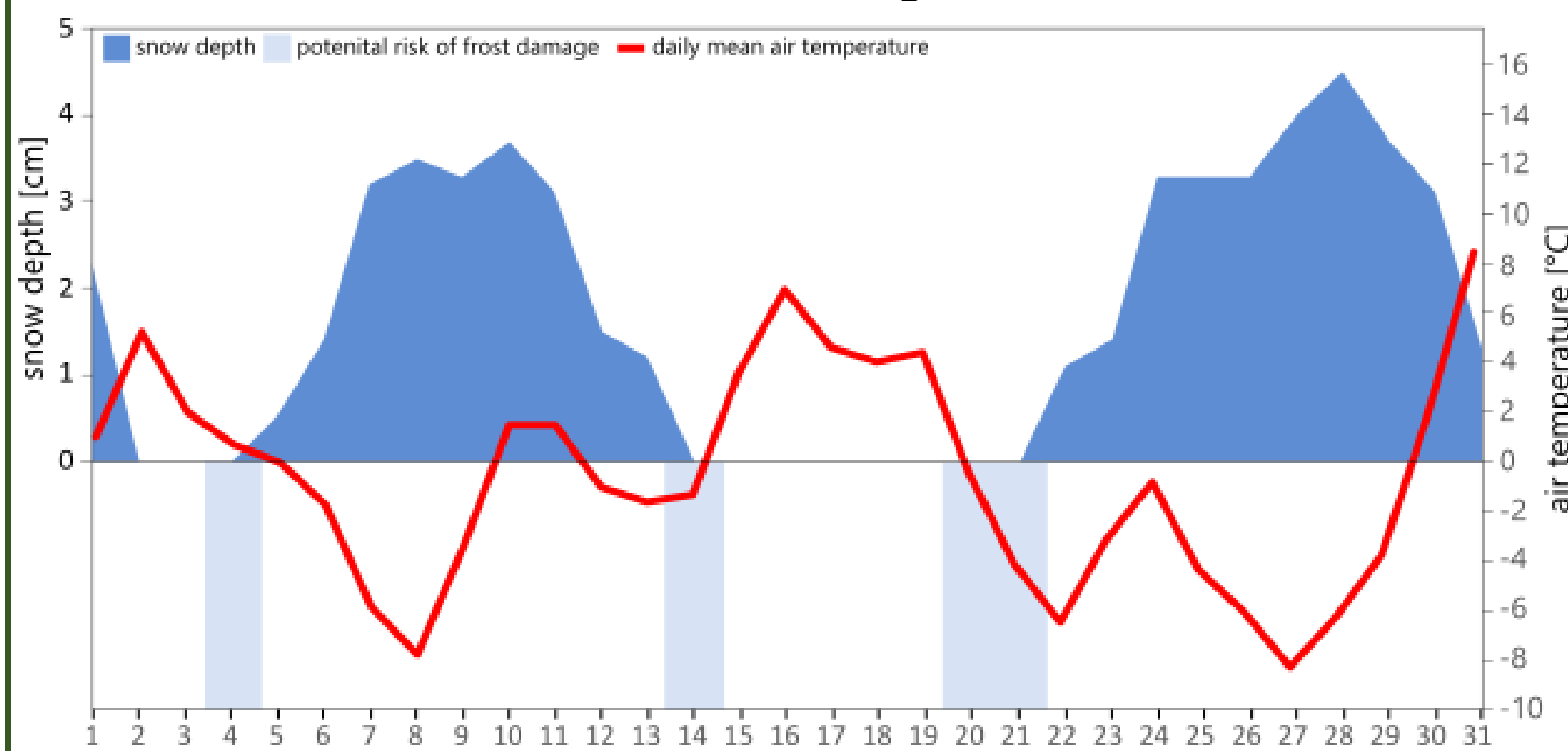
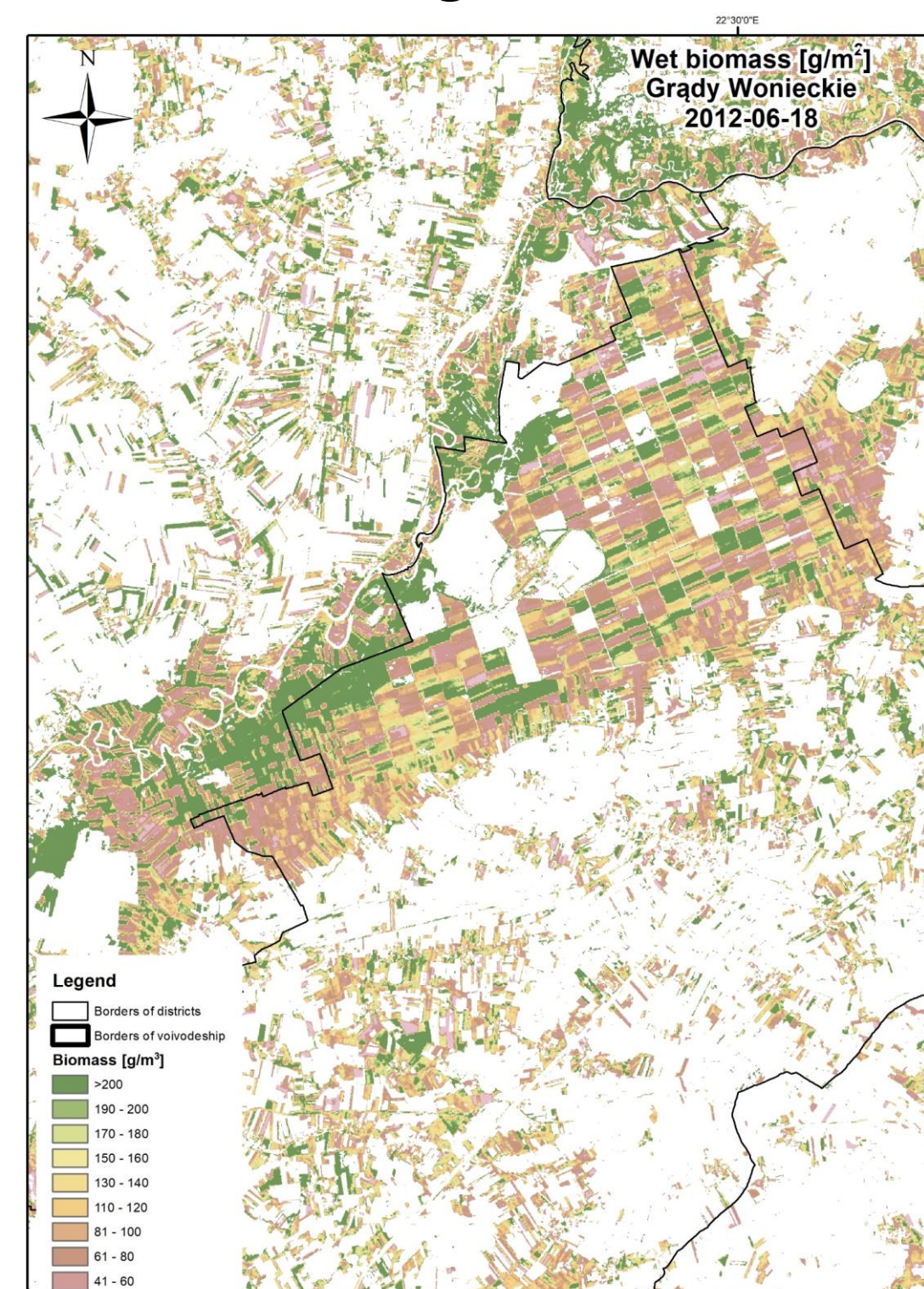
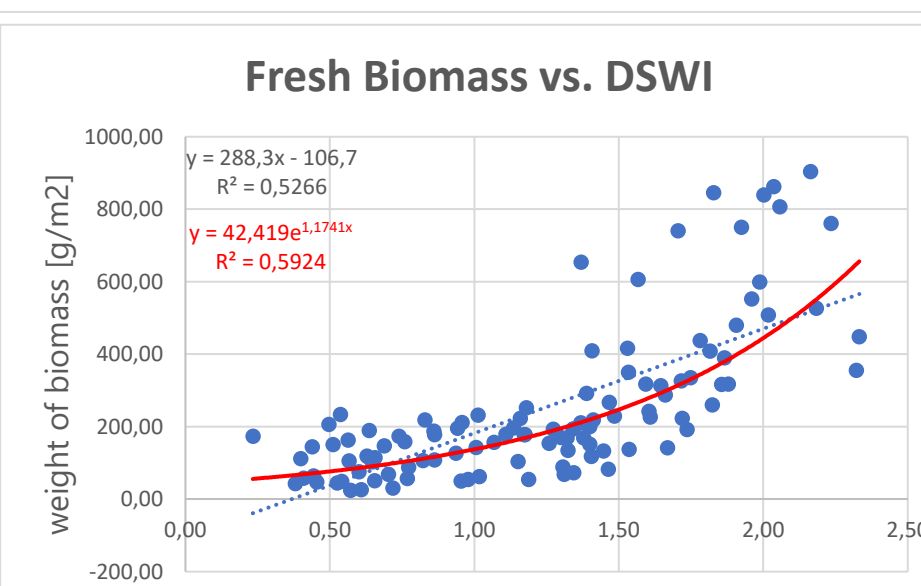
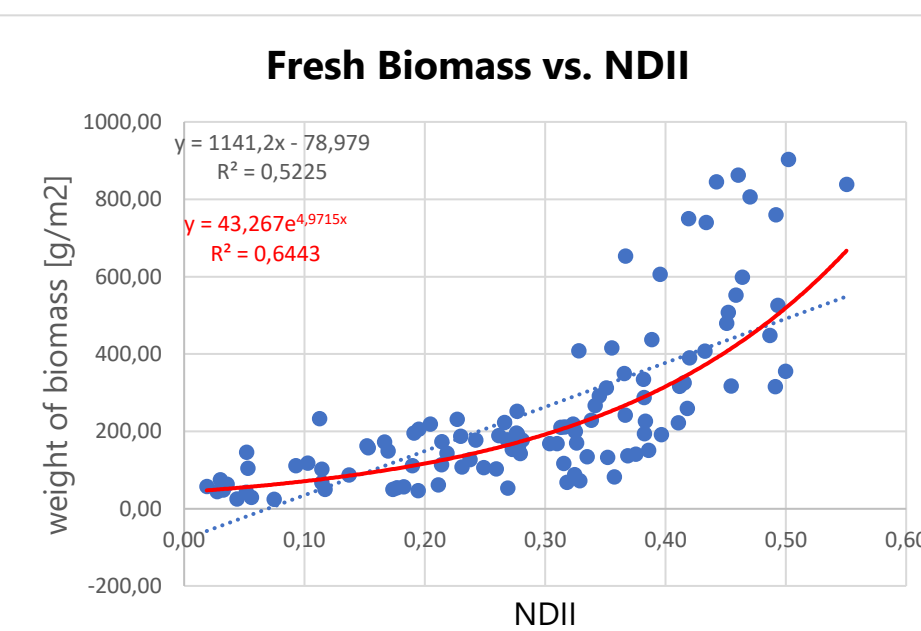


Illustration of a risk analysis for selected field in December 2021

Biomass modelling

Using field data and information on yields, biomass modelling was prepared on the basis of satellite indices

Estimating fresh biomass



Classification

The aim of classification procedure will be to discriminate two basic types of grasslands:

Extensive grasslands

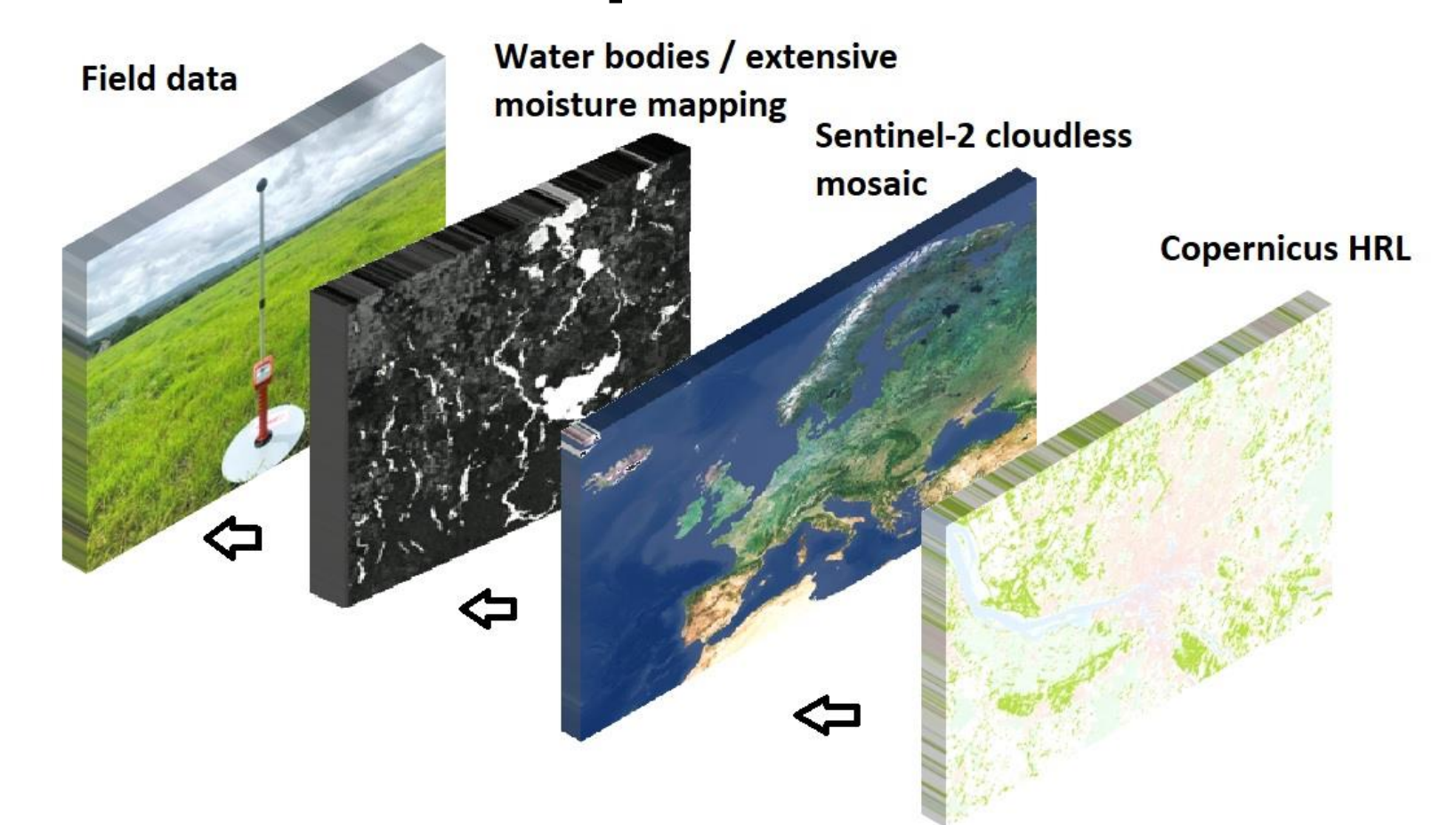


Intensive grasslands

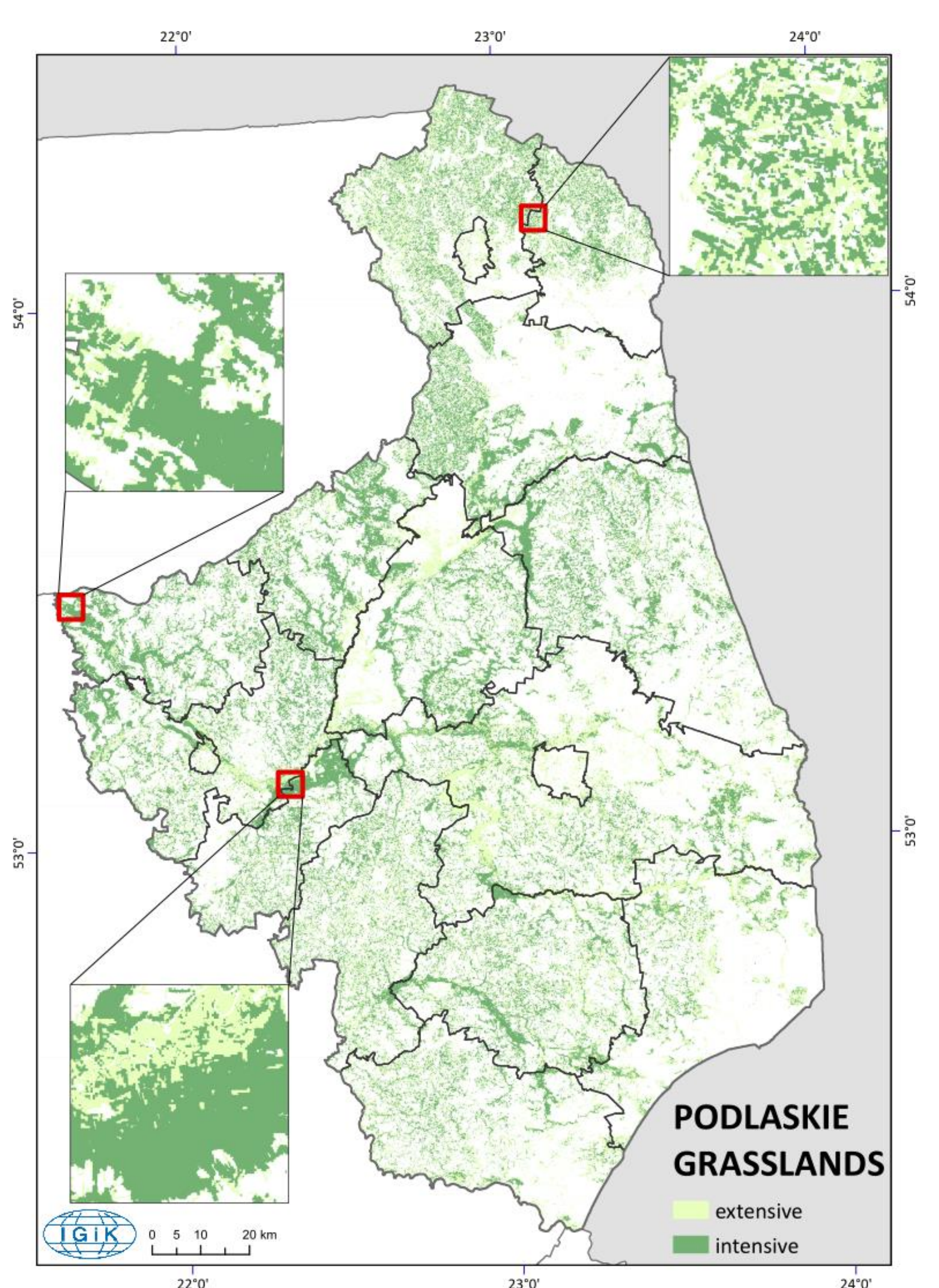


Based on multi-temporal Sentinel-2 imagery, field data and a grassland mask, classification was performed using machine learning algorithms.

Input data



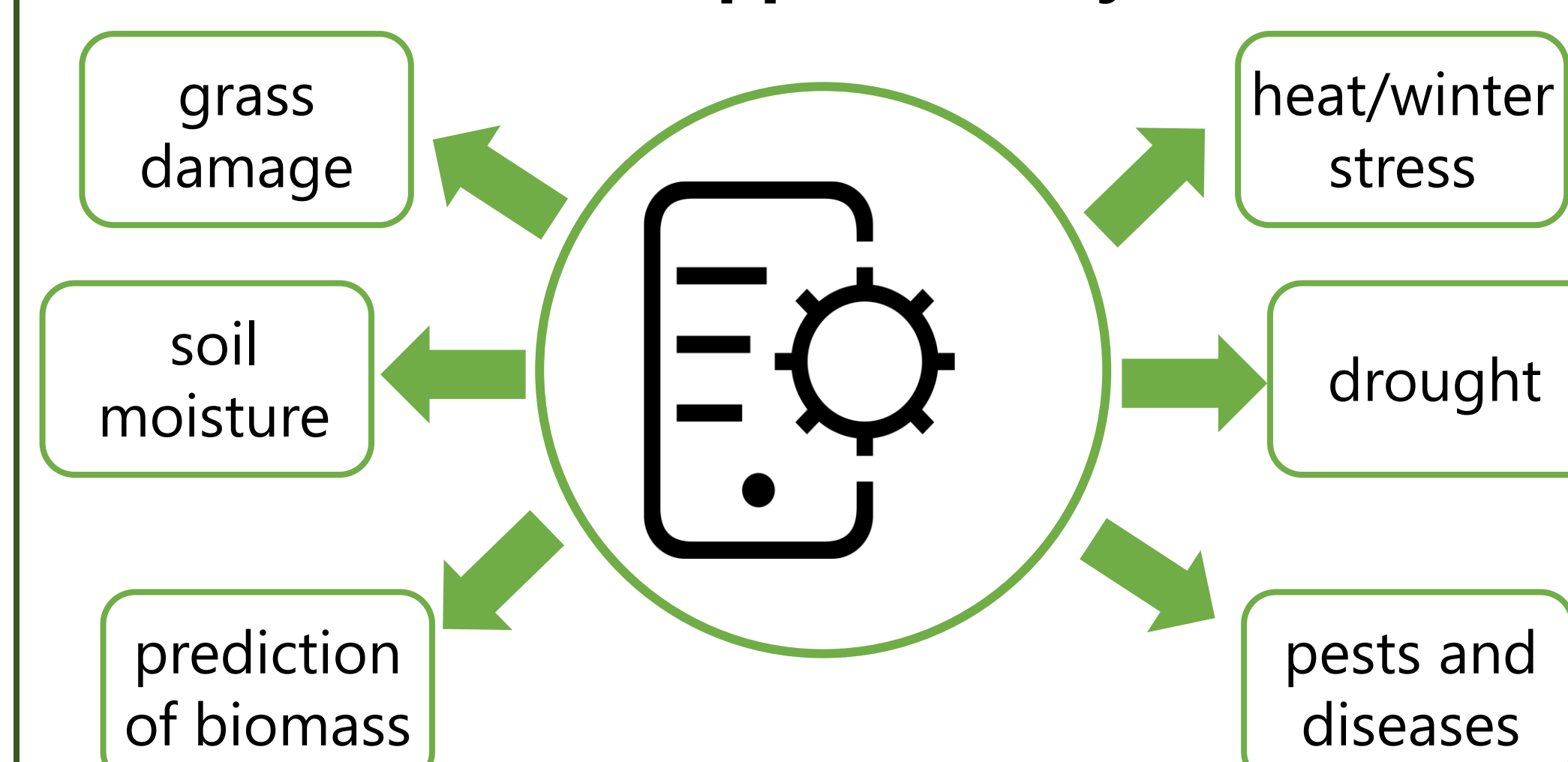
Classification results



Conclusions

The ultimate goal of the project is to develop a web portal and mobile application to communicate the project results to farmers and the farming community.

Mobile application system



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