“Data assimilation of remote sensing data for farm scale maize fertilization in northern Italy”

UNIVERSITÀ DEGLI STUDI DI MILANO
DIPARTIMENTO DI SCIENZE AGRARIE E AMBIENTALI - PRODUZIONE, TERRITORIO, AGROENERGIA

LAND SUPPORT

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EGU European Geosciences Union

INTRODUCTION

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Sentinel-2 images → retrieving crop vegetation indices

Indices can be effectively used to guide variable rate fertilization in

In this study, field management information (maize sowing and harvesting dates, tillage, fertilization) and estimated vegetation indices **VI** (Sentinel 2 derived Leaf Area Index **LAI**, Normalized Difference Vegetation Index **NDVI**, Fraction of Photosynthetic radiation **fPAR**) were analysed to develop a batch-mode **VIs** routine to manage high dimensional temporal and spatial data for Decision Support Systems DSS in precision agriculture, and to optimize the maize N fertilization in the field.

The routine is meant as a user-friendly tool to obtain time series of assimilated VIs of middle and high spatial resolution for field crop fertilization. It also overcomes the failures of the open source graphic user interface of Sentinel Application Platform (SNAP).

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METHODS

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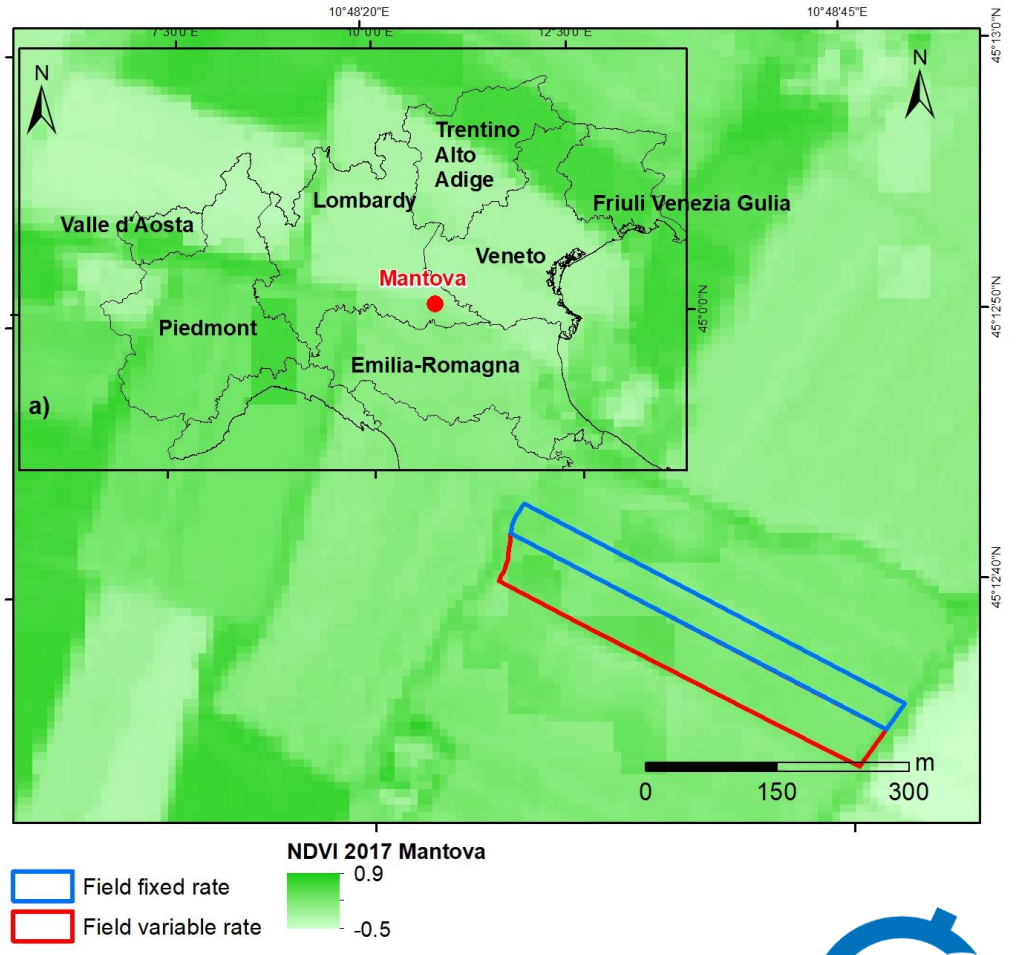
Study site and data collection

The study was carried out in maize (2017-2018) on a farm located in Mantua (northern Italy); the soil is a Vertic Calciustepts with a fine silty texture with moderate content of carbonates.

A collection of Sentinel 2 images (with <25% cloud cover) were processed using Graph Processing Tool (GPT).

This tool is used through the console to execute SNAP raster data operators in batch-mode.

Yield data were acquired with a volumetric yield sensing in a combine harvester.
Fertilization plans were then calculated for each field prior to the side-dressing fertilization to define the optimal quantities of Nitrogen.



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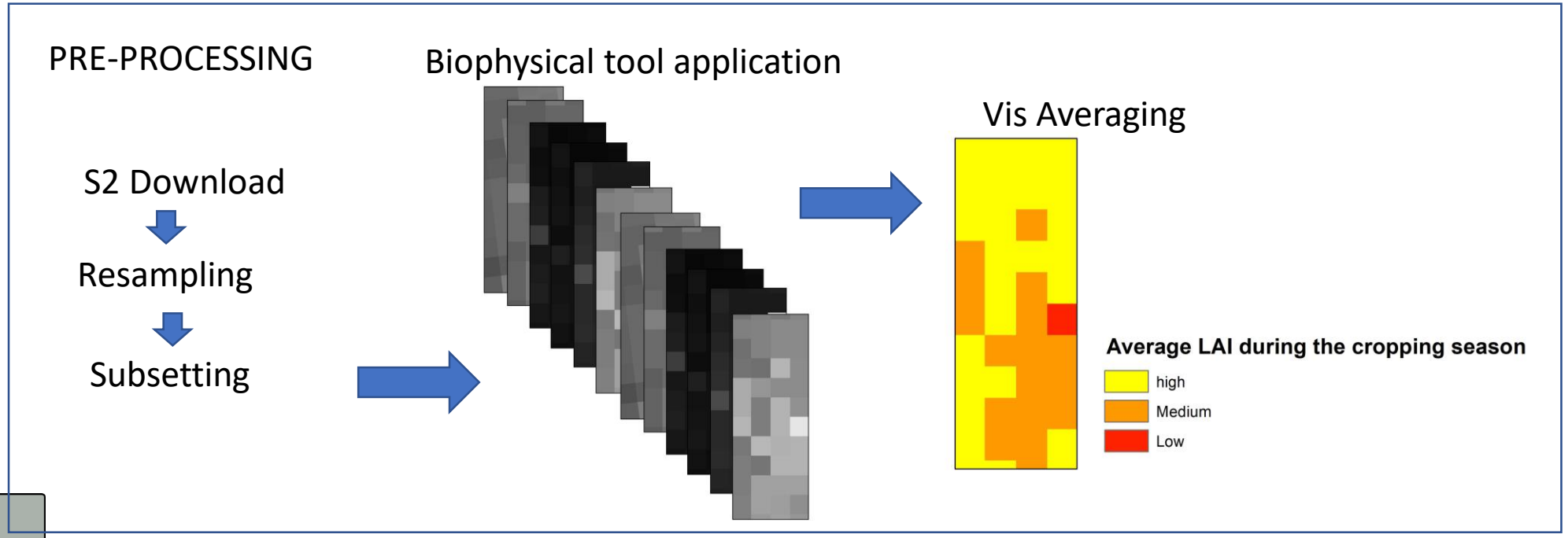
Study site and data collection

The workflow applied on the Sentinel images consisted of the following steps:

- Resampling each band to 10m pixel size;
- Splitting data into subsets according to the farm boundaries using Region of Interest (ROI);
- Using the Biophysical Toolbox to derive LAI, fPAR for the estimation of maize Vis from emergence until senescence.
- **Outcome: time series of LAI in 2 cropping seasons that allows for the definition of homogeneous zones within the fields**



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PRELIMINARY RESULTS

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- For the year 2018, yield data were related to the 34 LAI derived from Sentinel 2a products at 10 m spatial resolution (R^2=0.42).
- This result underlined a trend that can be further studied to define a cluster strategy based on soil properties.
- As a further step, we will test whether spatial differences in assimilated VIs, integrated with yield data, can guide the nitrogen top-dress fertilization in quantitative way more accurately than a single image or an average of selelcted images.
- LAI data will be assimilated into the **ARMOSA** crop model in the **LANDSUPPORT** project both at field and sub-field scale to improve yield forecast.

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Financing project:

https://www.landsupport.eu/

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