Evaluation between *mapped* vs. *declared* data

At Island / cadastral parcel level

Evaluation between *mapped* vs. *declared* data

At Island / cadastral parcel level

Declared tobacco
Classified tobacco
Field survey

Evaluation between *mapped* vs. *declared* data

At Island / cadastral parcel level

Cadastral sheet
Classified tobacco
Declared tobacco

Classified Ha: 27.98

Declared Ha: 28.07

- 0.09 Ha

Evaluation between *mapped* vs. *declared* data

At Island / cadastral parcel level

Classified Ha:
23.15

Declared Ha:
24.37

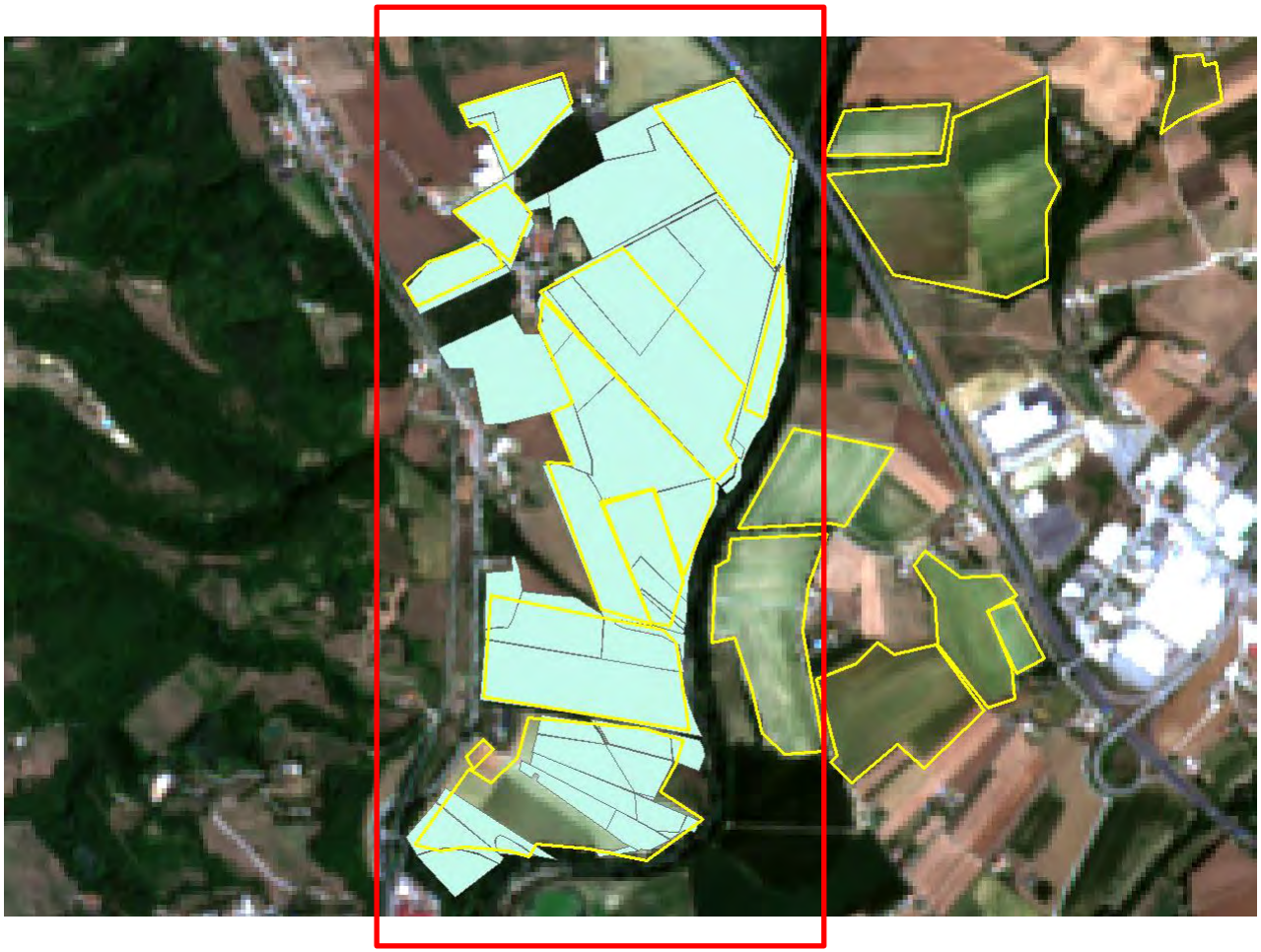
Cadastral sheet
Classified tobacco
Declared tobacco

Classified Ha:
15.13

Declared Ha:
15.76

Evaluation between *mapped* vs. *declared* data

At Island / cadastral parcel level



Cadastral sheet
Classified tobacco
Declared tobacco

Classifed Ha: 27.98

Declared Ha: 28.07

- 0.09 Ha

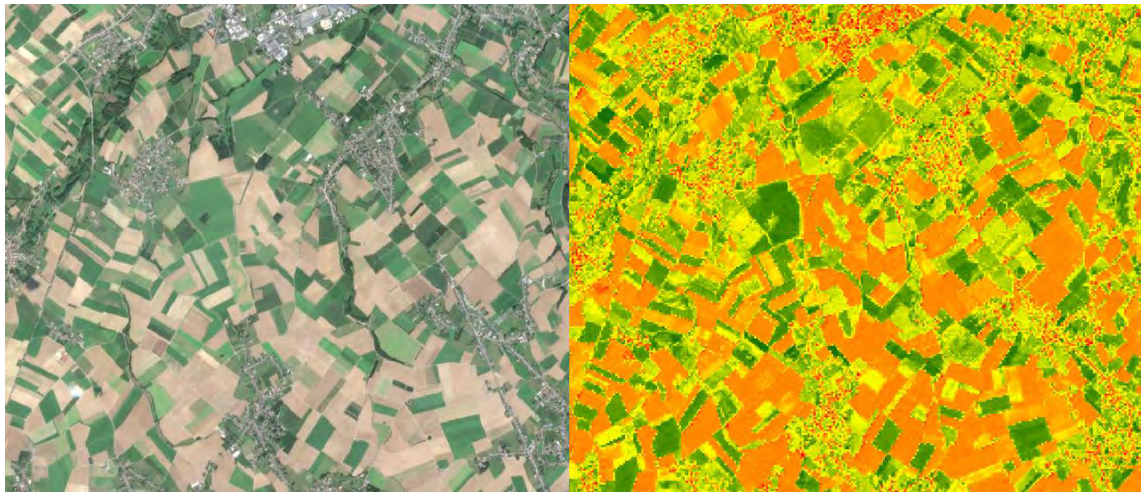
Valutazione tra dato *mappato vs dichiarato*

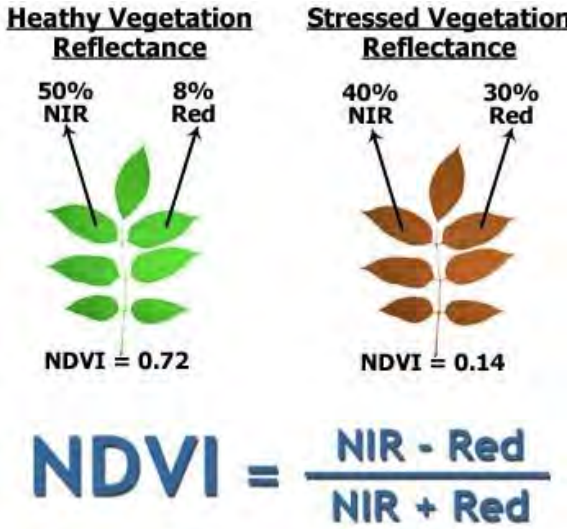
Identification of undeclared tobacco?
(to be checked in case the parcel not found/matching on the cadastral webgis system)

Declared tobacco
Classified tobacco
Field Survey

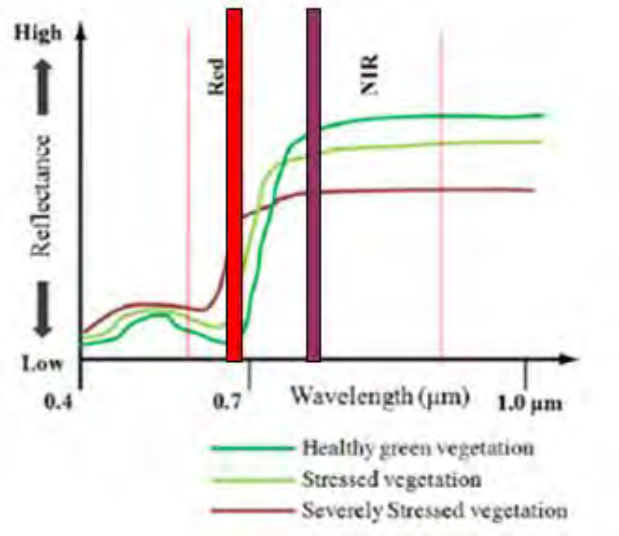
Phase 3 - Tobacco monitoring maps

NDVI - Normalized Difference Vegetation Index



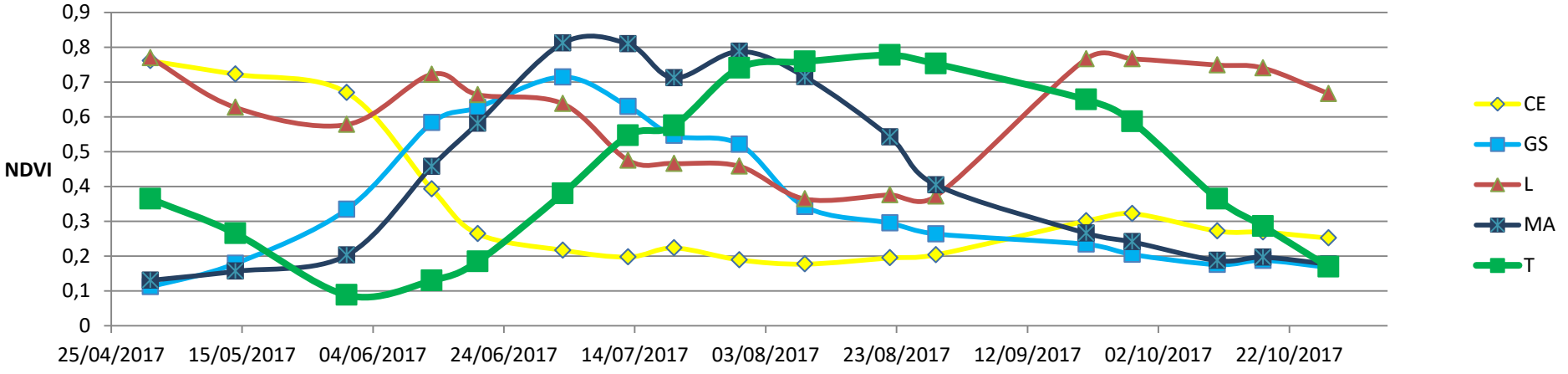


Index variable between -1 and 1

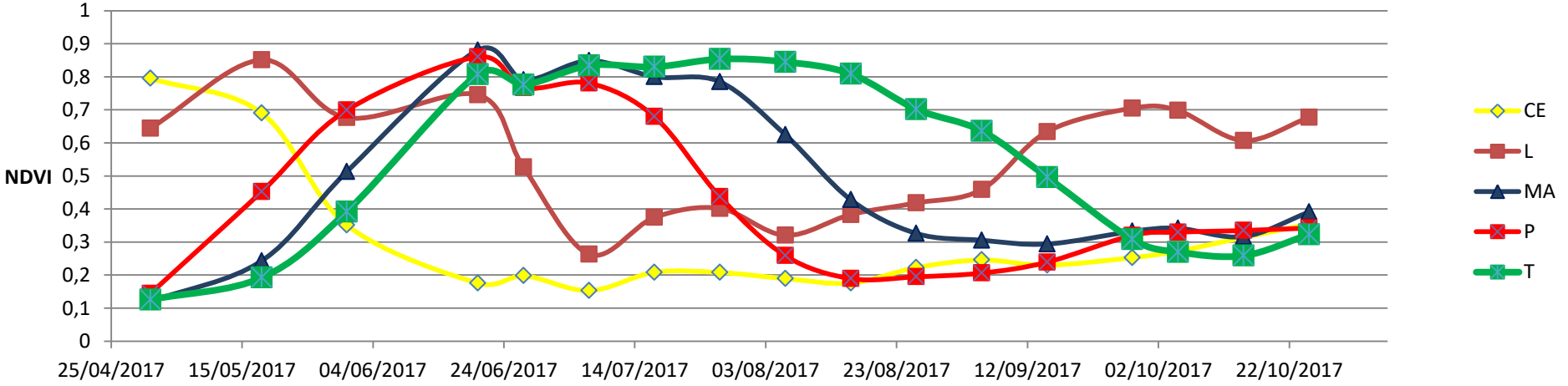


NDVI trend for the main crops

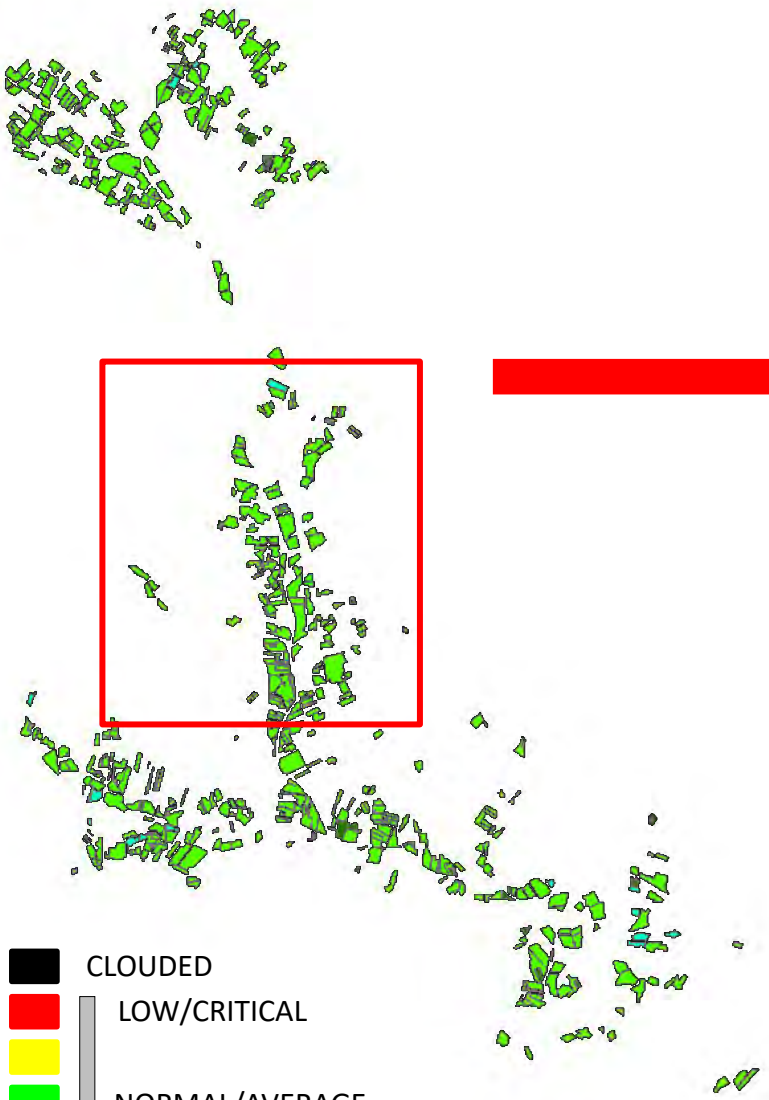
North Area - Umbria

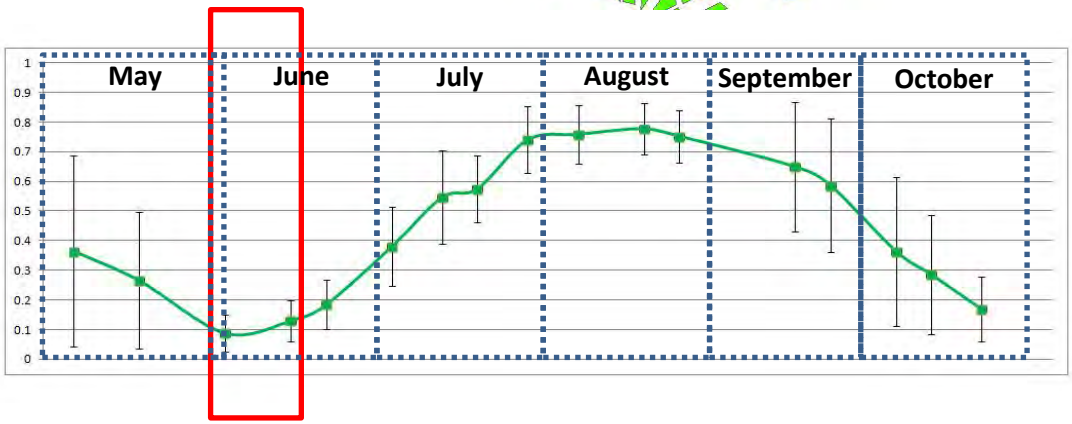


South Area - Campania



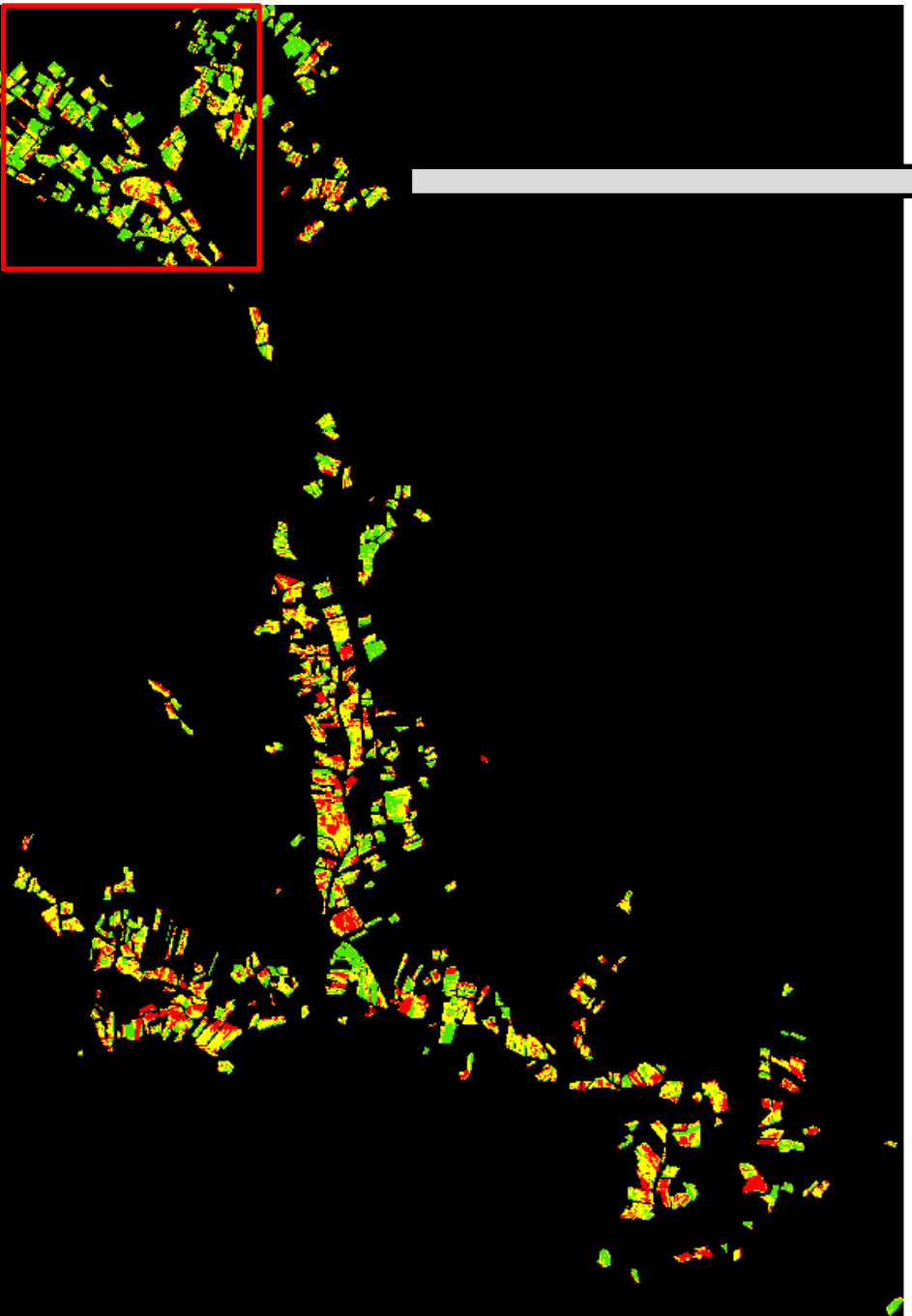
Phase 3 - Tobacco monitoring maps

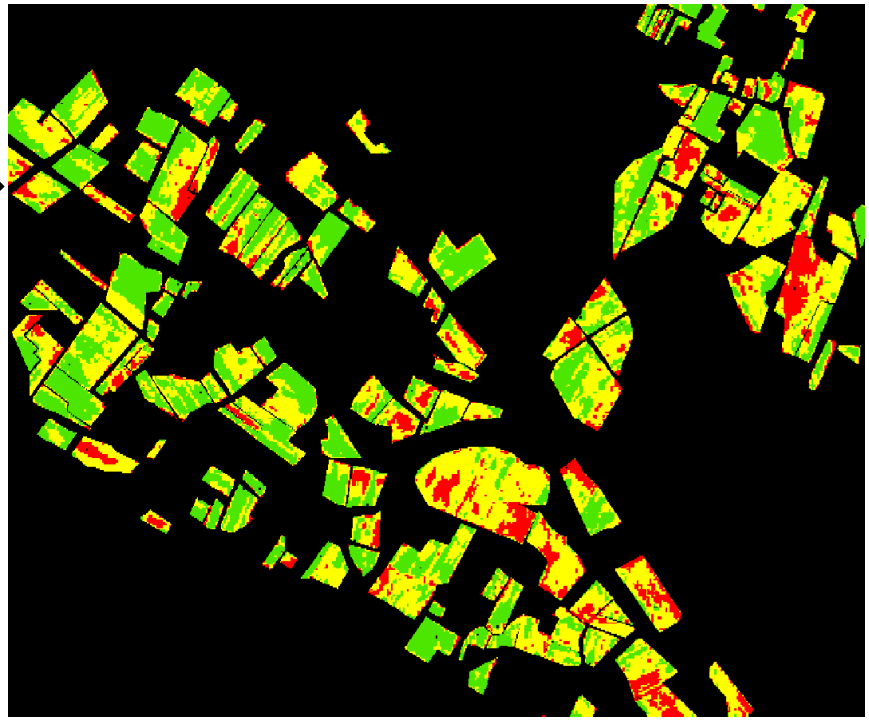




Transplantation phase

Phase 3 – Vigor maps





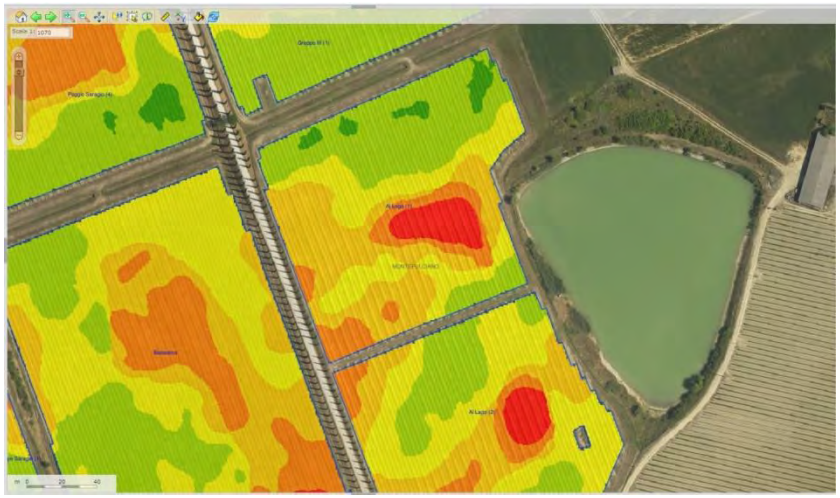
Situation at 13/07/2017

- Low Vigor
- Average Vigor
- High Vigor

Variable Rate Technology (VRT) Fertilization

Analysis of time series remotely sensed data
Expectation Maximization Clustering

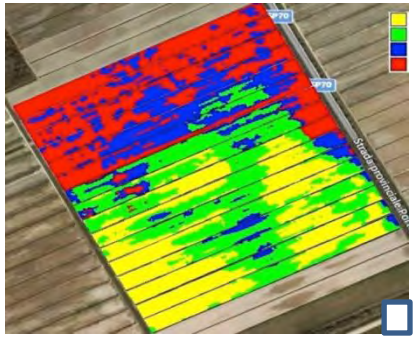
Mapping of soil variability and production potential



Microelements (N, P, K) balancing model

Prescription maps for VRT fertilization

Rateo-variabile fertilizer spreader
with maps reading GPS system



Variable Rate fertilization tests on experimental plots

(2° year)

Interventions on covering fertilization

Phase 4 - *iTab* platform development

[Link to *iTab*]

Closing remarks

The Sentinel data allows a **correct classification of tobacco**. The results of accuracy (assessed with data found on the fields) achieved in both Umbria and Campania (with the check campaign it **exceeds 95% of accuracy**), where different varietal groups and different cultivation conditions prevail are considered excellent. The spectral data of tobacco has a high separability with all other crops (especially in Umbria). **Some classification errors are also recovered during the mapping refining phase**.

At island level, the difference between the mapped and declared surfaces is in the order of half hectare (in Umbria). At municipal level there are differences that fall within 10 hectares (except for San Tammaro which must be verified). **These deviations are considered to be completely compatible with the project assumptions** and the main reasons for these differences would appear to be attributable to:

- polygonation accuracy for low geometric resolution (and consequent representation scale) of the remote sensing data (resolution of 10m) as well as sporadic classification errors that would tend to underestimate the surfaces of few percentage points

- accuracy of the declared data that refers to a given cadastral land registry that often does not follow the real “land use” geometries and is declared in advance net of the cultivation problems and of the crop success.

Closing remarks

A difficult question: which surface data can be considered more accurate, TLR or declared?

Criticality: the possibility of using the TLR data to highlight illegal tobacco growing is subject to an effective (automatic?) georeferencing system of the declaration data. The Italian Fiscal Agency has recently published a first open data service for the cadastral survey that is being developed. Another possibility could be the use of platforms such as the SIM (Mountain Information System)

Activity: having the mapping from TLR and the declared data available, would be a valid support to the control activity, allowing to quickly verify in the field any undeclared production units.

In addition to the controls, the *iTab* platform could provide additional services to the various actors in the supply chain, being able to centralize a powerful geographical database of tobacco growing (tobacco cadastre) and activate a system of dynamic monitoring of the crop.

The calibration of the control maps of the vegetative conditions could be done over time having available the cultivation data of a sample of georeferenced production units in order to return further information of an agronomic nature (for example fertilization maps, production maps, etc.).