



# Information flow for precision crop management: a use case in the Tuscan regional territory

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# Precision crop management

**allows to combine agronomic management with the spatial and temporal variability of the agroecosystem**

## Aims:

- **To provide spatially precise and continuous information for the field management** (eg. to improve soil tillage, fertilization, pesticide application).
- **To improve economic and environmental efficiency** (Climate Smart Agriculture).
- **To promote automatic forms of documentation** (quality and environmental certifications, traceability, etc.)

# Precision crop management

The transition to **more environmental friendly farming systems** is an ambitious challenge, to which precision crop management (PCM) can significantly contribute.

While there has been a strong progress in terms of technological solutions (monitoring, communication and management of operating machines), at least in Italy, **there are still deficits in agronomic research and in the knowledge transfer that limit the farmers in adopting new solutions.**

## **Farmer perception of benefits in adopting PCM**

Support during fertilizer and pesticide distribution

Savings on use of equipment, chemicals, seeds, and fuel

Improvement of working conditions

Reduction of environmental impact

## **Farmer perception of limits**

High initial cost and difficulty in their amortization

Operating system with complicated language

RTK network coverage

Many different systems that often do not communicate

Qualified technicians are missing

in Tuscany the production of wheat and cereals is going through a period of severe crisis due to the low remuneration of the product with respect to high unit production costs

Starting from the previous rural development plan, we participated in short supply chain projects in which farmers, millers and final transformers (bakers, biscuit makers and pasta factories) were brought together in certification and product traceability systems.

The supply chain makes it possible to create a product identified with a territorial mark, differentiable and recognizable on the market, and therefore to increase the profitability for all the supply chain partners

### APPCoT

Agricoltura di Precisione per la Pasta dei Coltivatori Toscani

**Misura 124 del PSR 2007-2013**  
 "Cooperazione per lo sviluppo di nuovi prodotti, processi e tecnologie nei settori agricolo e alimentare e in quello forestale"  
 Bando PIF

### InnovaPane

"Processi innovativi per la produzione del "Pane Toscano a lievitazione naturale (DOP)"

**Misura 124 del PSR 2007-2013**  
 "Cooperazione per lo sviluppo di nuovi prodotti, processi e tecnologie nei settori agricolo e alimentare e in quello forestale"  
 Bando PIF

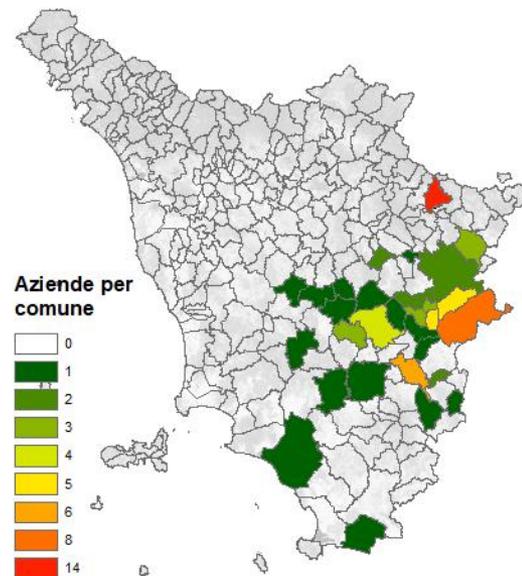
### Farro della Garfagnana IGP PROGETTO FaGadOP

**Misura 124 del PSR 2007-2013**  
 "Cooperazione per lo sviluppo di nuovi prodotti, processi e tecnologie nei settori agricolo e alimentare e in quello forestale"  
 Bando PIF



# Use case in Tuscany

## GrAnT



Sant'Anna  
Scuola Universitaria Superiore Pisa



Fondazione  
Clima e  
Sostenibilità



Regione Toscana



Intervento realizzato con il cofinanziamento FEASR del Programma di SviluppoRurale 2014-2020 della Regione Toscana sottomisura 16.2 progetto GrAnT

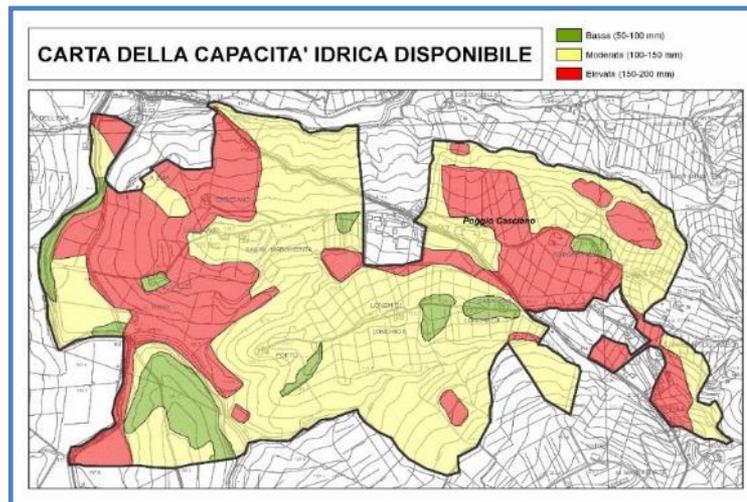
# Criteria of Innovations

- selecting and breeding of new and old cereal varieties
- equipping operating machines with GPS-RTK and others tele-control systems
- use high spatial resolution remote sensing images
- reinforce crop and field monitoring activities
- Integrate meteorological and seasonal forecast
- develop crop models and indices to interpret the vegetation indices and translate them into prescription maps for agronomic management
- collect and archive all information in a geodatabase
- development of a Traceability and Certification system
- apply farm information systems

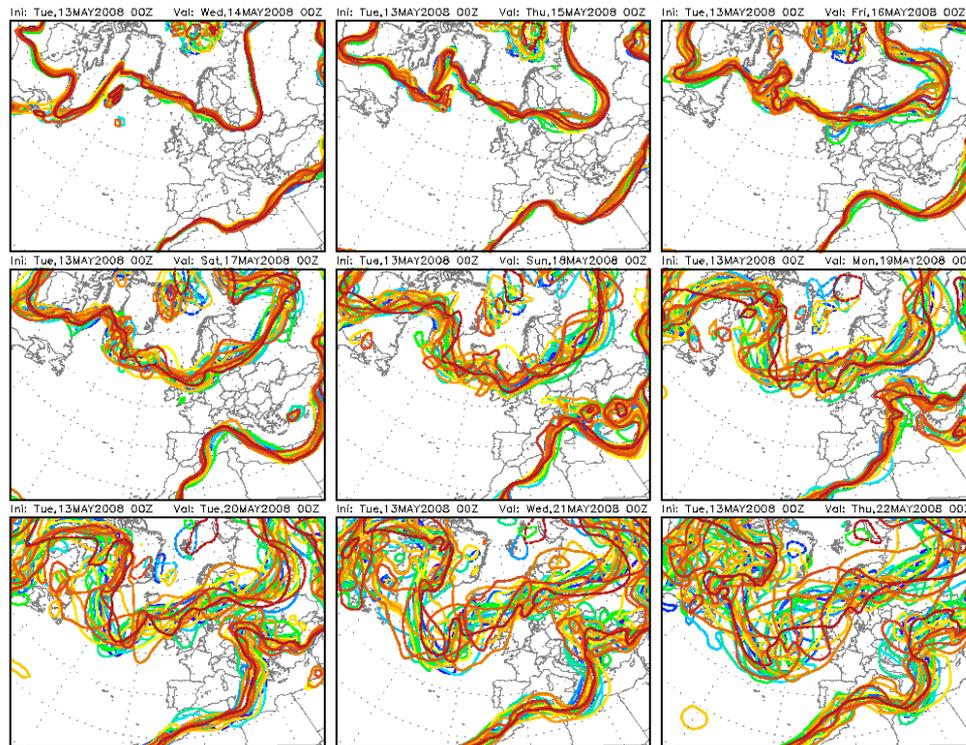
## Phases of decision-making process in precision crop management :

- 1) To analyze spatial and temporal variability within a field and to identify variability sources.
- 2) To define agronomic interventions, and schedule them to run
- 3) To evaluate the compatibility of the agronomic interventions with the field fertility levels and the production targets (quantity and quality).

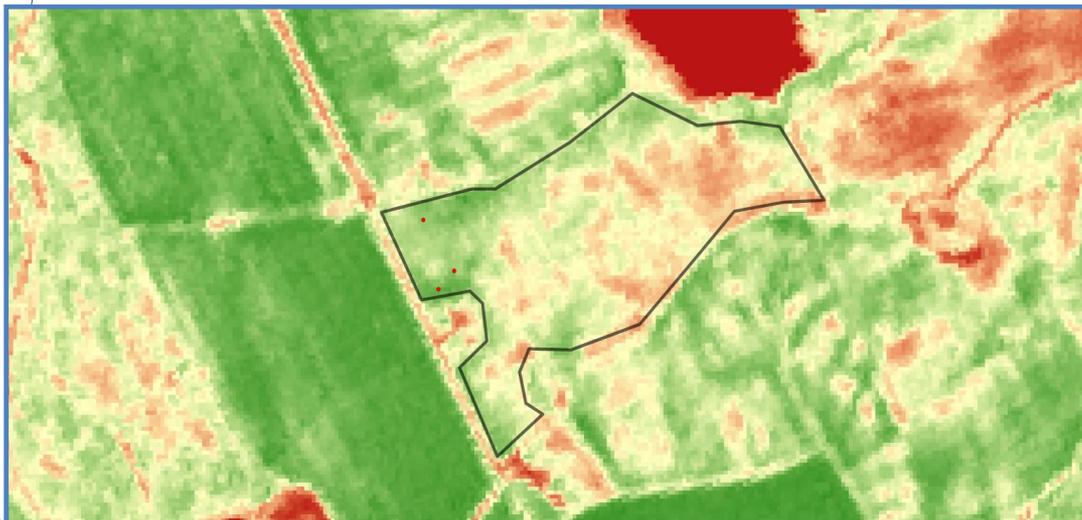
# Collection, organization and analysis of atmospheric, pedological, agronomic, and crop data



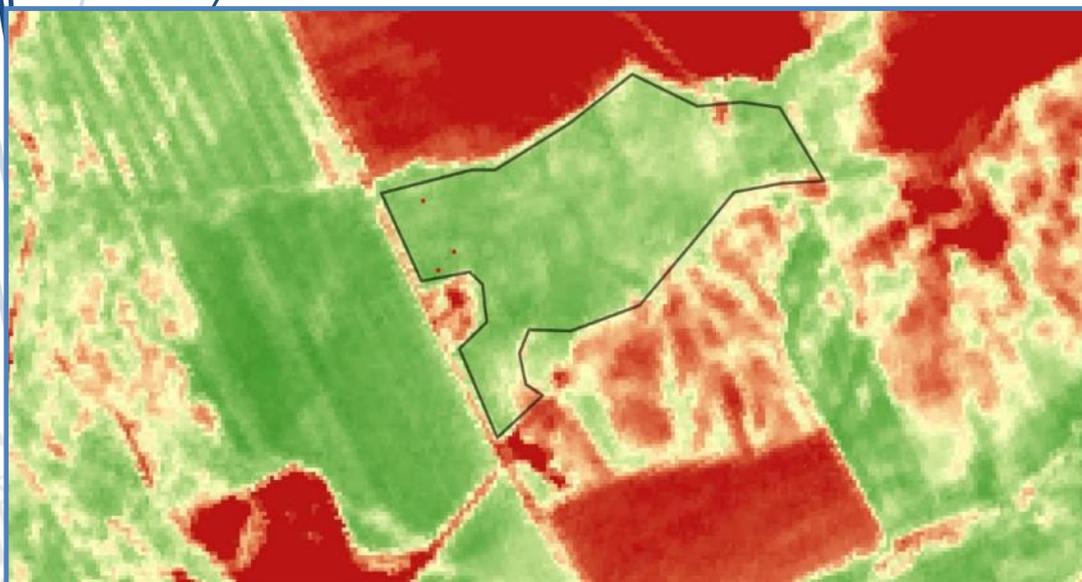
# Soil – climate variability



## Monitoring the chlorophyll index.....

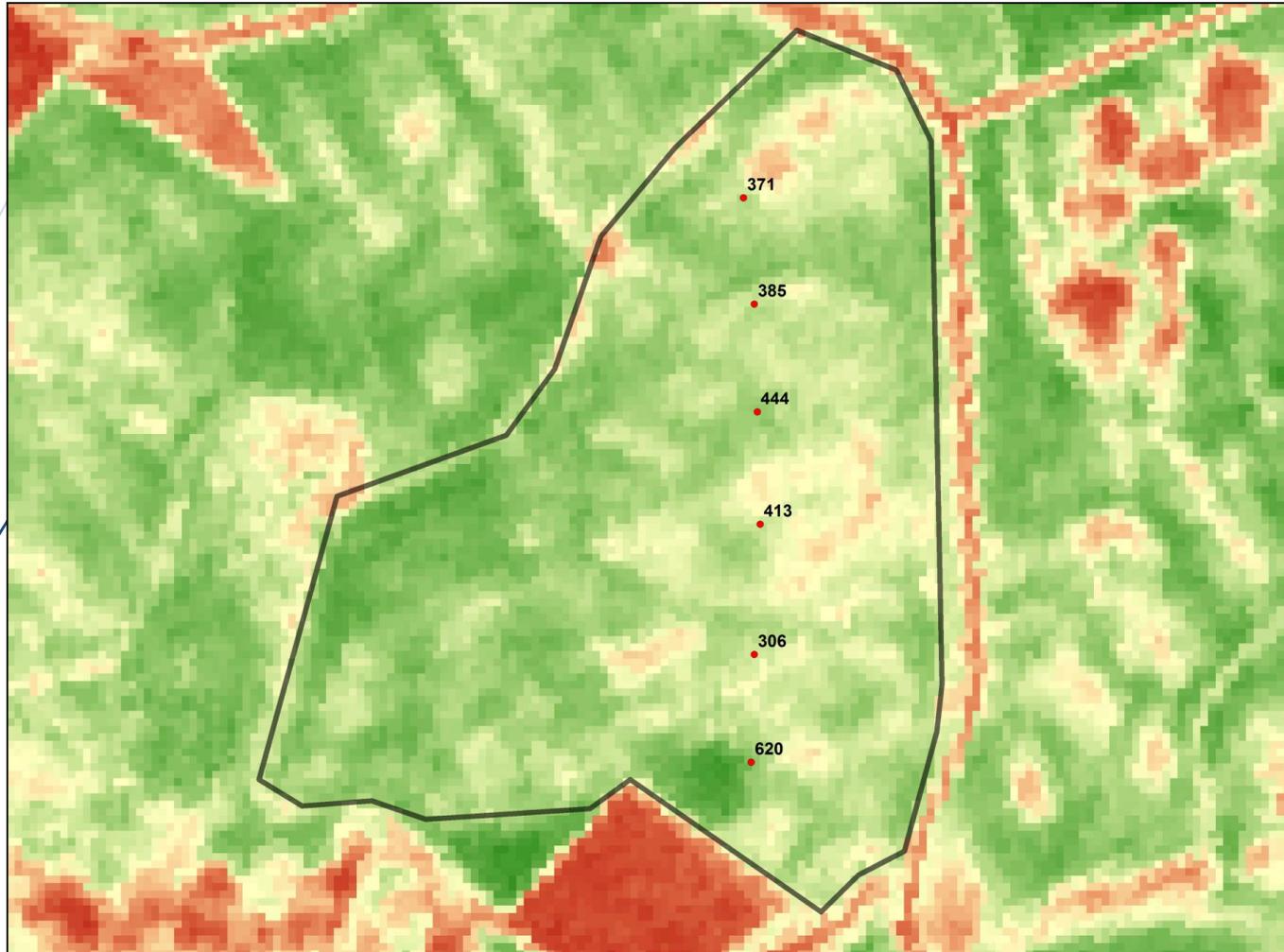


NDVI April  
(Val d'Orcia, Az. Agr. Rappuoli)



NDVI May  
(Val d'Orcia, Az. Agr. Rappuoli)

## ..... Nitrogen content



# Prescription map of FERTILIZATION



instrumentation for assisted driving and localized distribution of fertilizers



By integrating the previous data with crop growth model, and aiming to the target production, it is possible to create a fertilizer prescription map to distribute the fertilizer according to the crop effective requirement

# Prescription map of YIELD

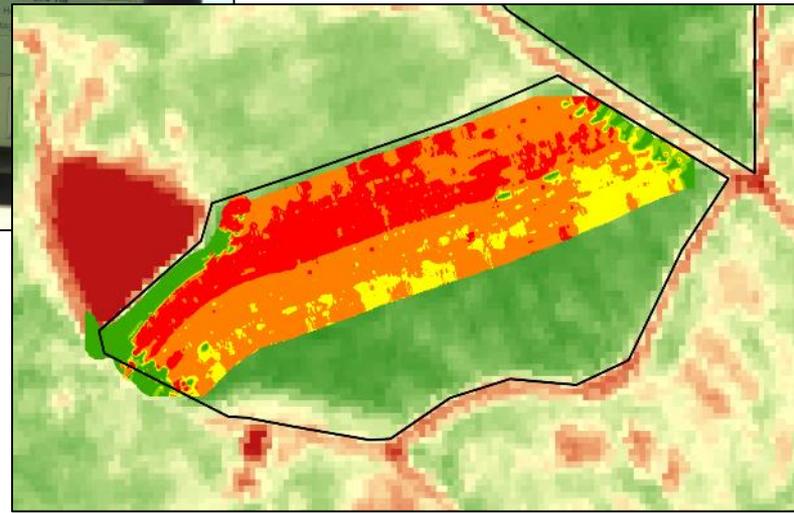


During the harvesting phase, the yield information is acquired  
These are useful for the traceability of all the activities carried out, and also to improve the cultivation operations and adopt new production models

Yield control system  
installed on the  
combine harvester



Yield map (2017)



# Farm management software

| Pedologia HWSD                       |            |
|--------------------------------------|------------|
| Capacità idrica:                     | 100 mm     |
| Argilla:                             | 26         |
| Capacità scambio cationico:          | 19         |
| Descrizione del terreno:             | Franco     |
| Ghiaia:                              | 7          |
| Limo:                                | 29         |
| Percentuale di carbonio nel terreno: | 0.799805 % |
| Ph del terreno:                      | 6.90039    |
| Sabbia:                              | 45         |

the management software is integrated with the distribution systems of fertilizers, pesticides and with the yield monitoring system. Therefore, it allows to track the operations carried out on each field of the farm in order to improve the management planning and for the purposes of product certification



## A special thanks to the farms that have supported these activities

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**Thanks for  
your  
attention**