# APPLICAZIONI DI INTELLIGENZA ARTIFICIALE PER IL RISPARMIO IDRICO IN AGRICOLTURA


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# Sommario

1) UAV per il monitoraggio della biomassa delle colture arboree

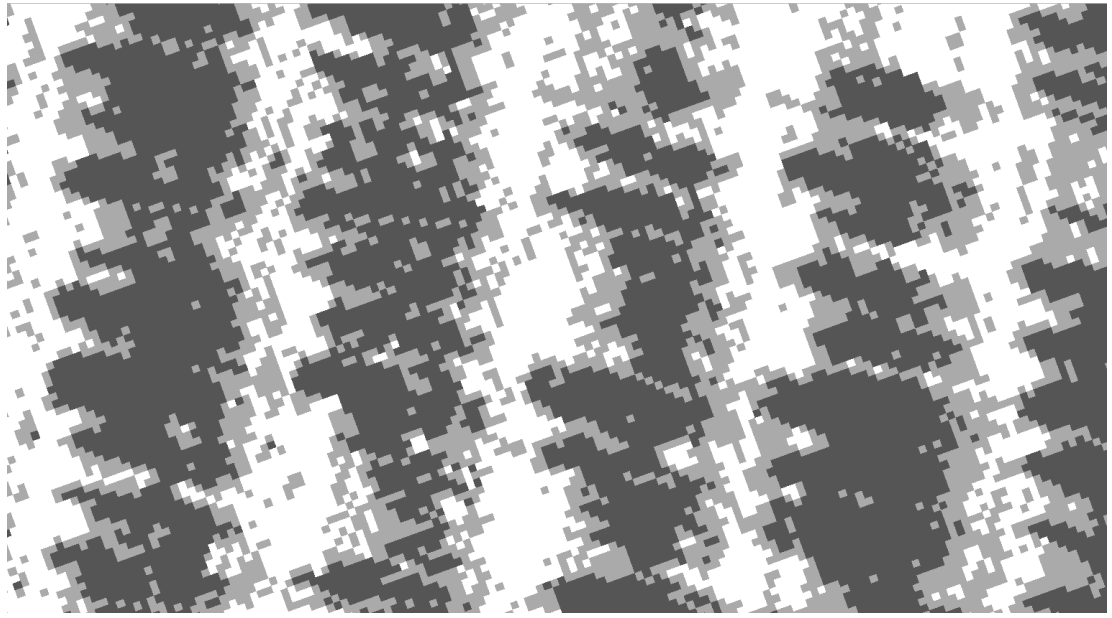
2) Telerilevamento per l’identificazione delle colture e la stima dei consumi

3) Automazione avanzata dell’irrigazione

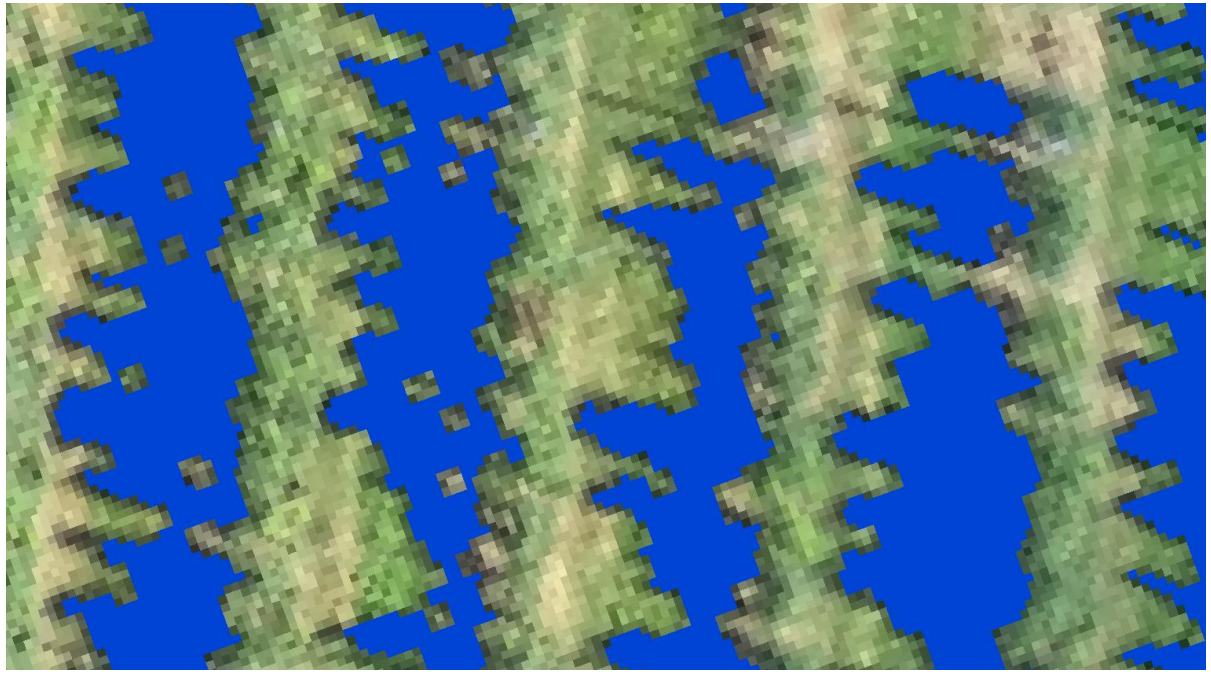
# 1) UAV per il monitoraggio della biomassa delle colture


RGB

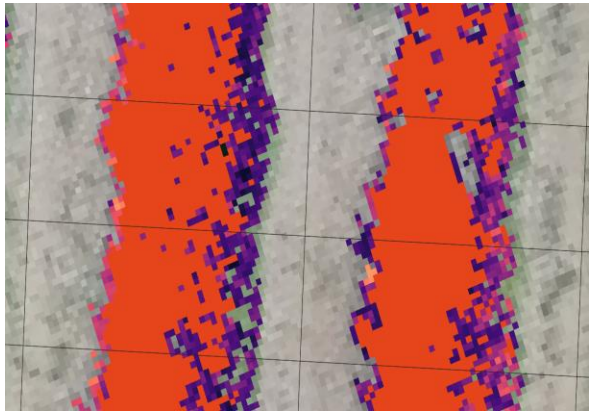
AI - Kmeans Clustering 4K

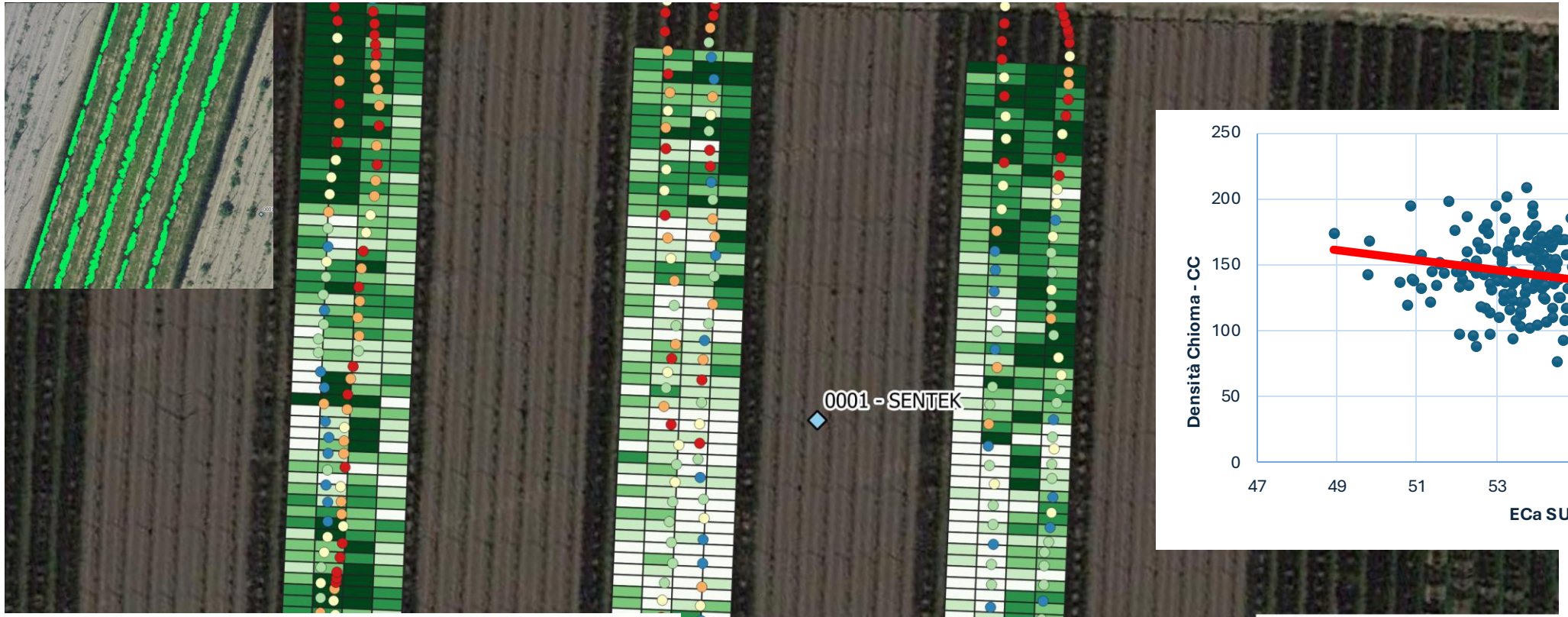


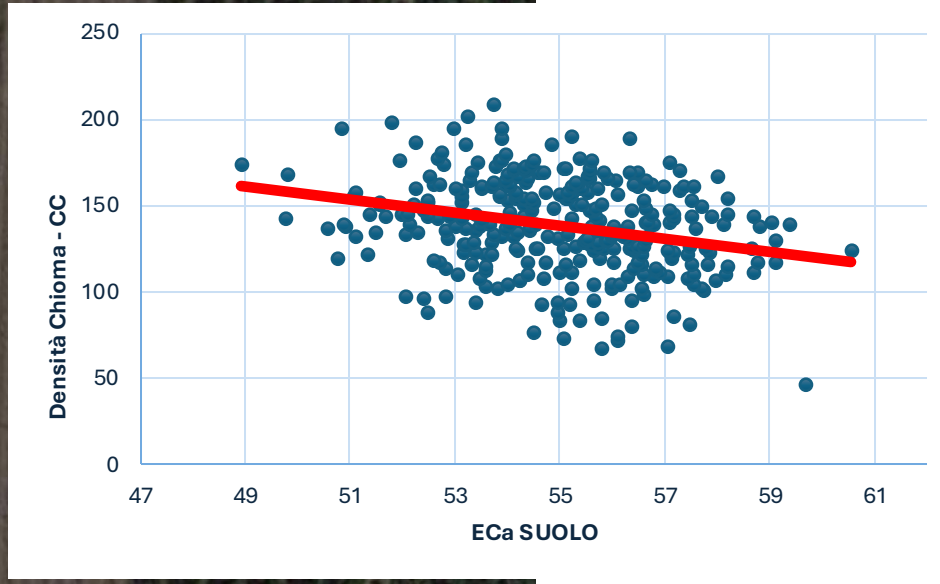
Cluster Selection and Process images – closing circle 1



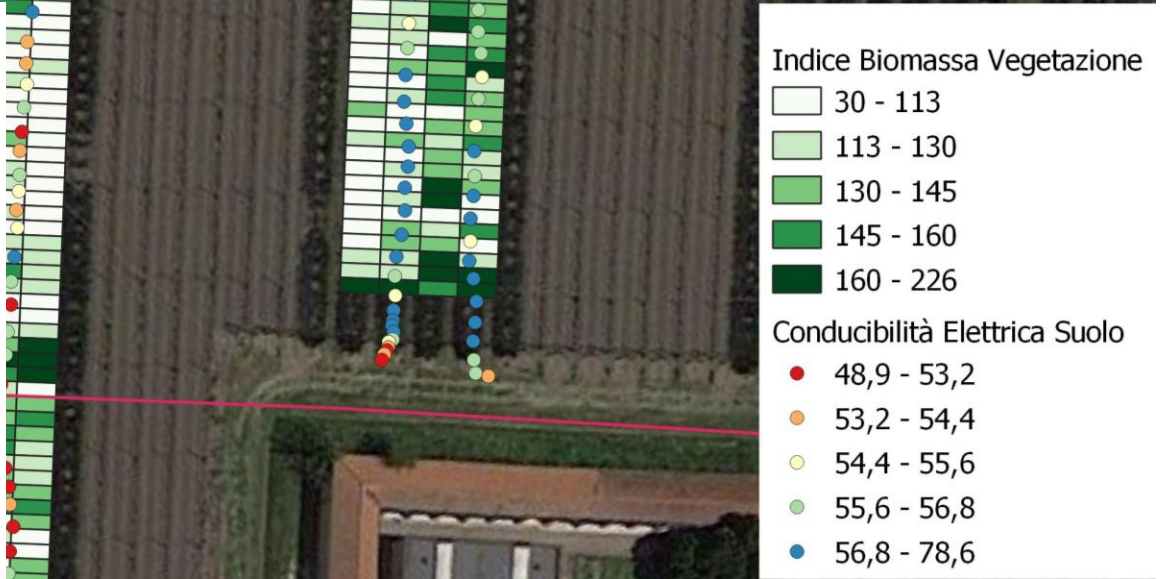
AI – MASKING for thermal measurement of canopy



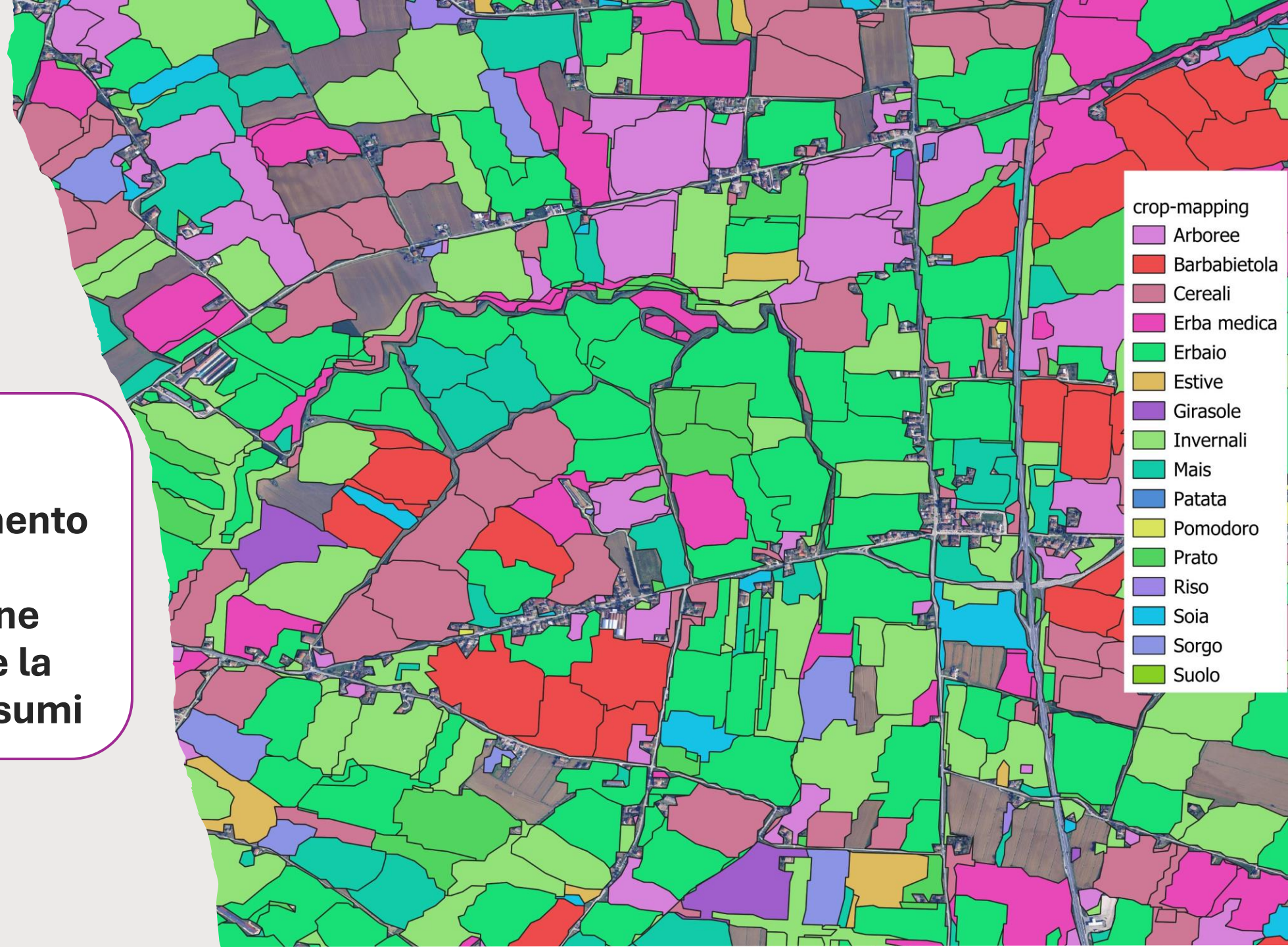

0001 - SENTEK


250
200
150
100
50
0
Densità Chioma - CC
47
49
51
53
55
57
59
61
ECa SUOLO


arrow·F
1000
60"
1
2
1
1


Indice Biomassa Vegetazione
30 - 113
113 - 130
130 - 145
145 - 160
160 - 226
Conducibilità Elettrica Suolo
48,9 - 53,2
53,2 - 54,4
54,4 - 55,6
55,6 - 56,8
56,8 - 78,6

## 2) Telerilevamento per l’identificazione delle colture e la stima dei consumi



# Sviluppo algoritmo classificazione colturale

RF
SVM
NNET

**Machine learning (ML) algorithms**

1° Aprile
1° Maggio
1° Giugno
1° Luglio
1° Agosto
1° Settembre

**Lead time**

i) soil, ii) tree crops, iii) grassland, iv) winter crop, and v) summer crop

v) tomato, vi) maize, vii) sorghum, viii) sugar beet, ix) sunflower, x) soybean, xi) legume, xii) potato, and xiii) other crops

**Crop classes**

Dataset
VIs + crop class

Train
Test

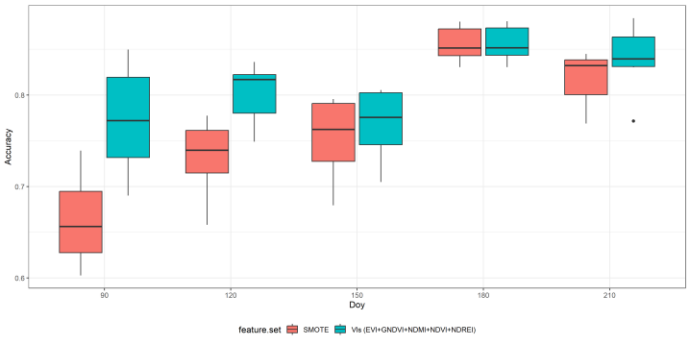
Based on years and crop class

Split

**Data partioning**

Validation Fold
Training Fold
1st
2nd
3rd
10th
K Iterations (K-Folds)
Repeated 5 times

**Tune hyperparameters**




(1): Definizione classi colturali: come trattare arboree

(2) Definizione della ROI (solo pianura)

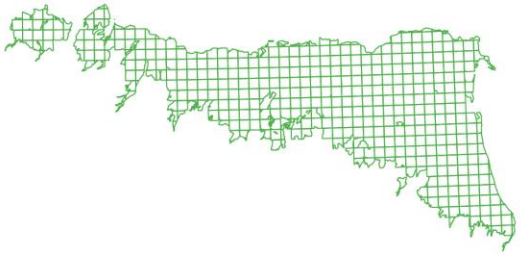
(3) Definizione limiti appezzamenti

**Leave-one-year out cross validation**

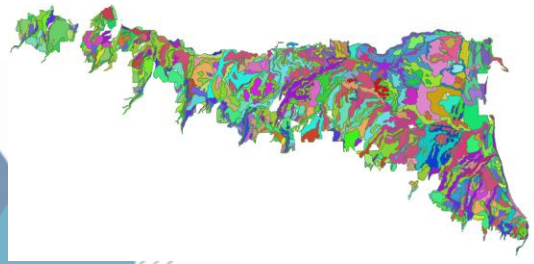
# IRRIFRAME: Territorial irrigation water management

**SIGRIAN irrigation districts**

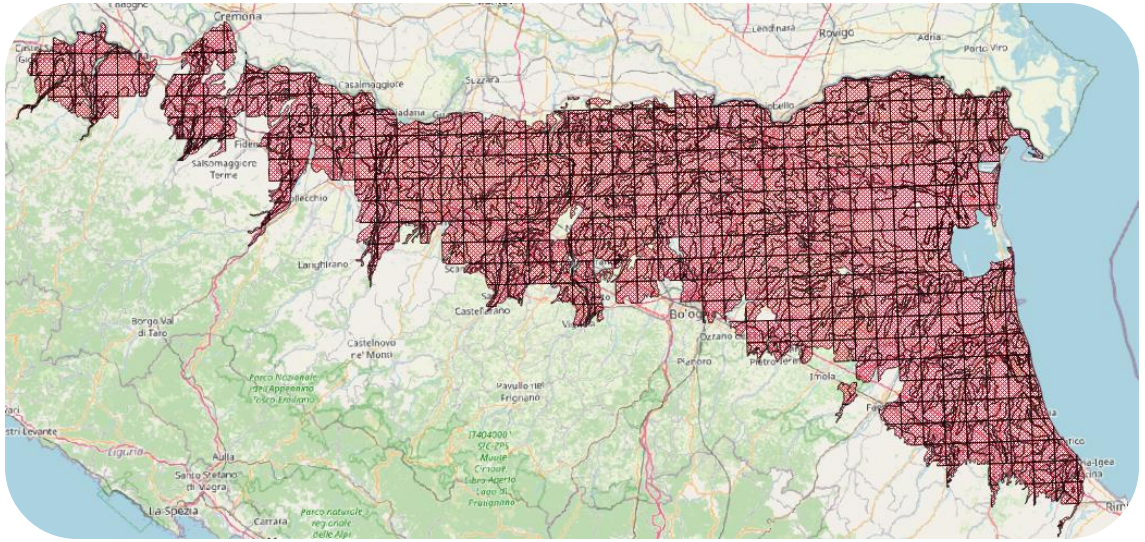
**ARPAE weather grid**



**Soil map of Emilia-Romagna**

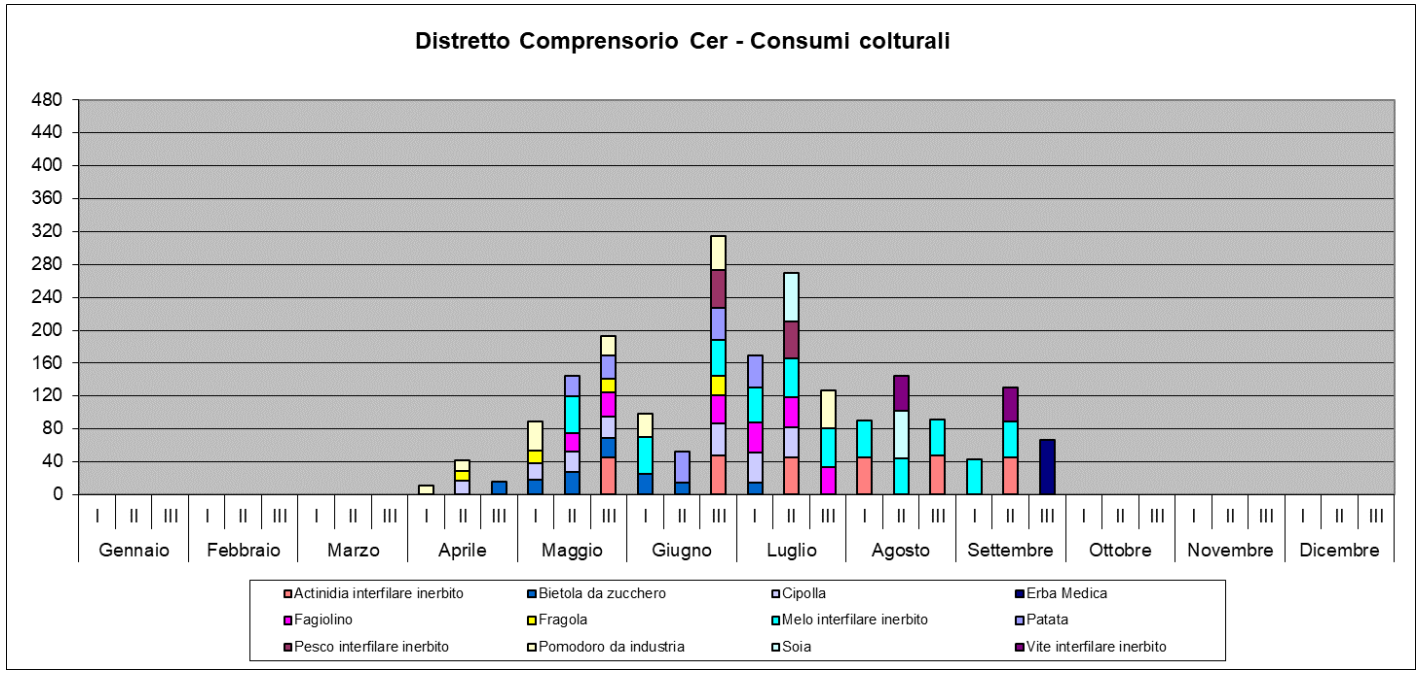


Map of unique combinations of weather and soil assigned to SIGRIAN irrigation districts



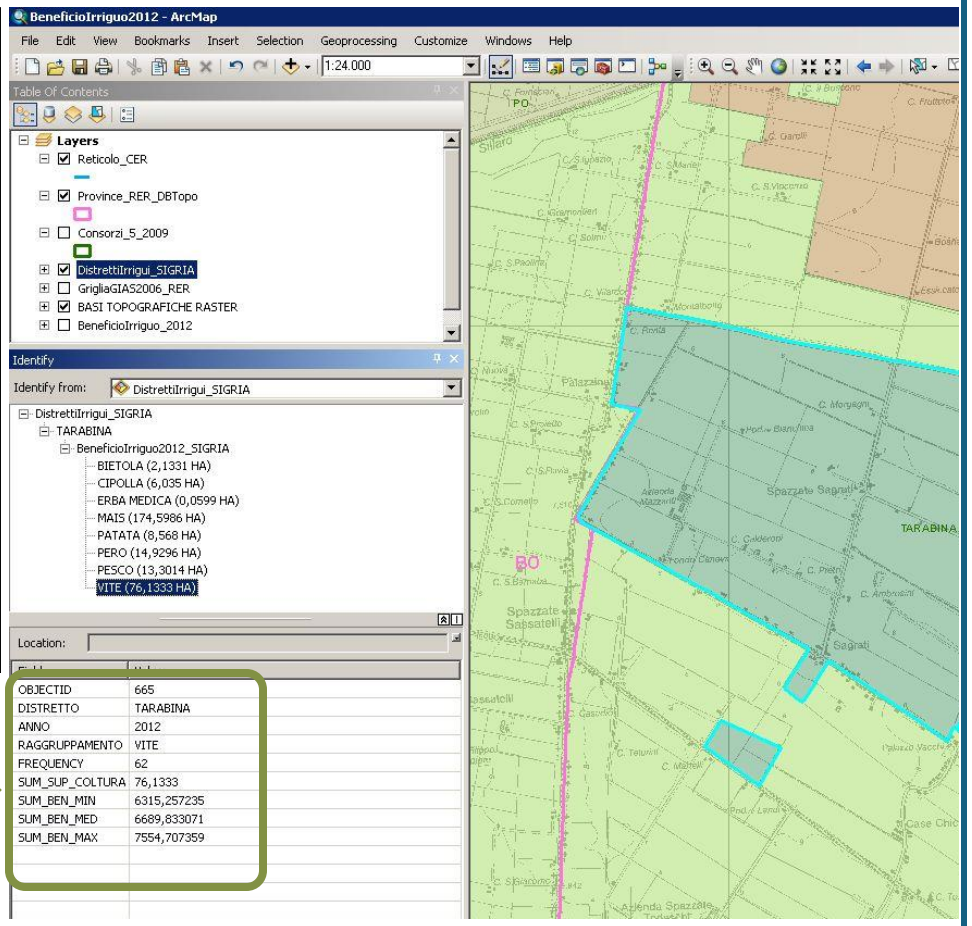
# IRRIFRAME: Territorial irrigation water management

## Data and analyses in Excel format



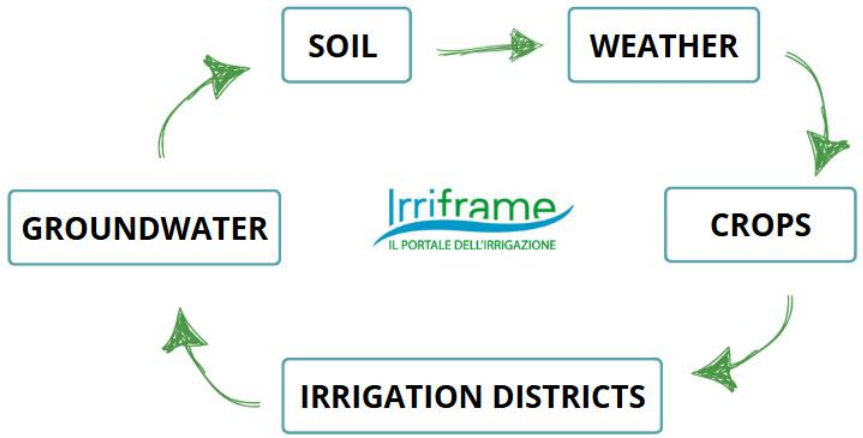

| PROVINCIA | COLTURA | BENEFICIO UNITARIO MINIMO | BENEFICIO UNITARIO MEDIO | BENEFICIO UNITARIO MASSIMO |
|---|---|---|---|---|
| BO | BIETOLA | 223 | 256 | 303 |
| BO | CIPOLLA | 163 | 175 | 184 |
| BO | MAIS | 59 | 66 | 75 |
| BO | PATATA | 212 | 246 | 276 |

## GIS data (SicCER, SIGRIAN)

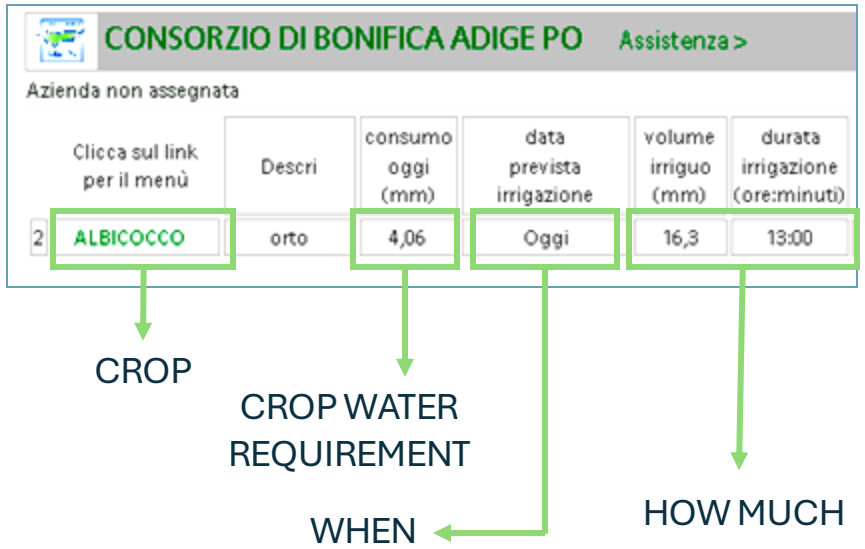


# DSS and AI for irrigation planning

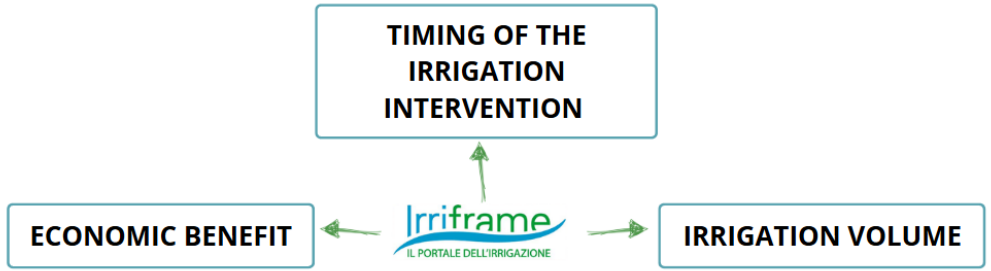
## Input Data for WATER BALANCE

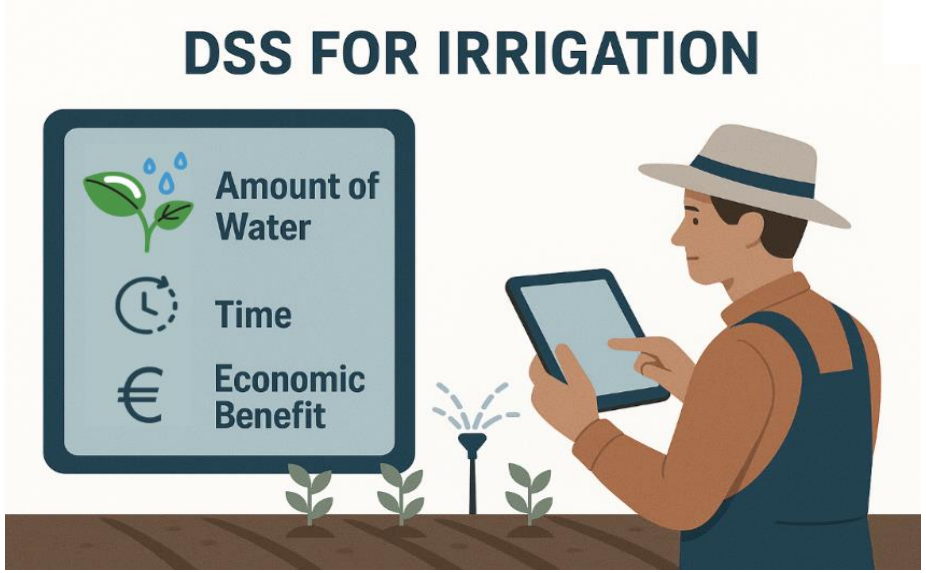



Interface example →



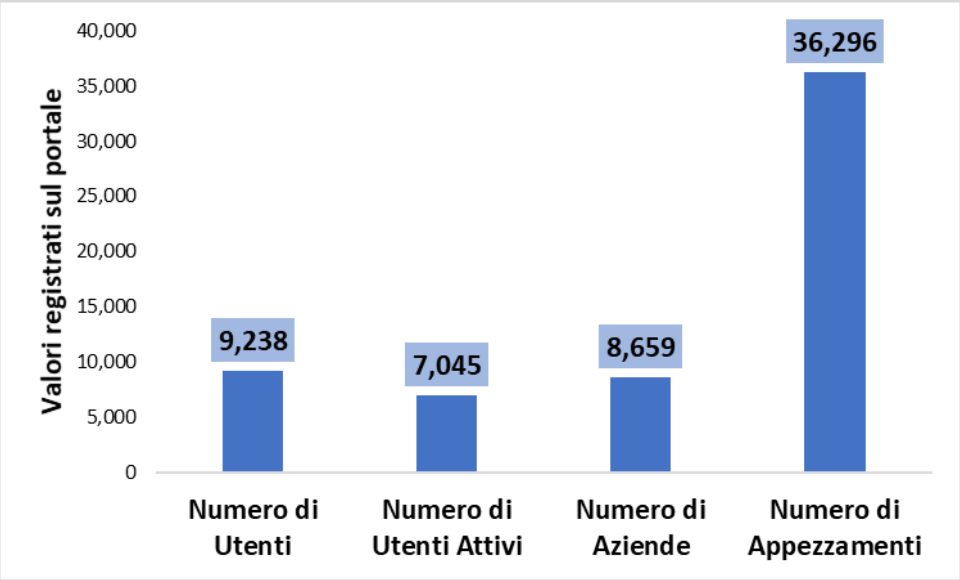

## Output Data for WATER BALANCE



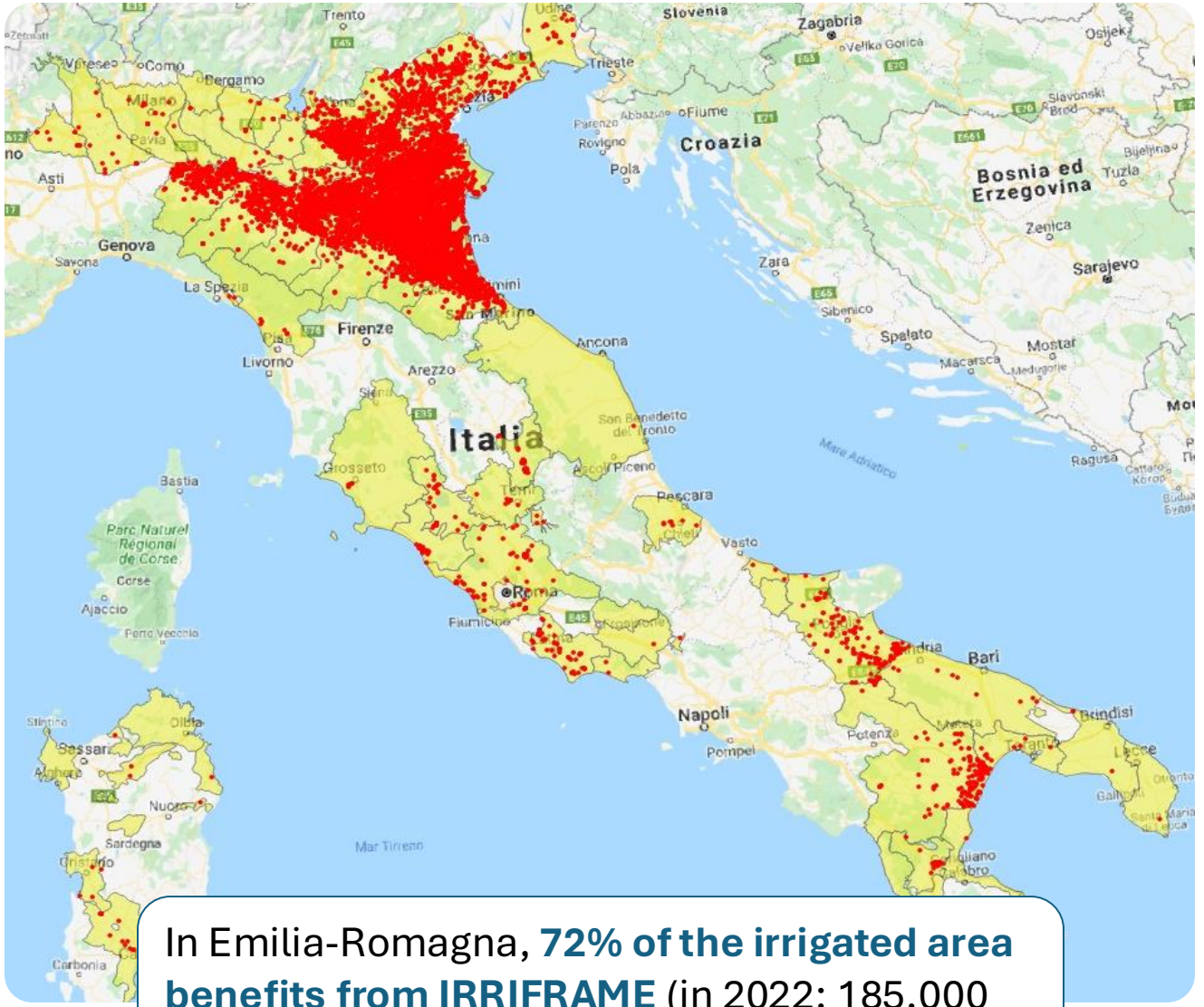



# IRRIFRAME: Service Coverage

- 69 Consortiums
- 16 Regions
- 7mil Ha
- 15.000 WEB accesses
- 700.000 irrigation advice IF




Irrigation surface 2021: **240.880ha**




In Emilia-Romagna, **72% of the irrigated area benefits from IRRIFRAME** (in 2022: 185.000 ha out of 257.000 ha irrigated)

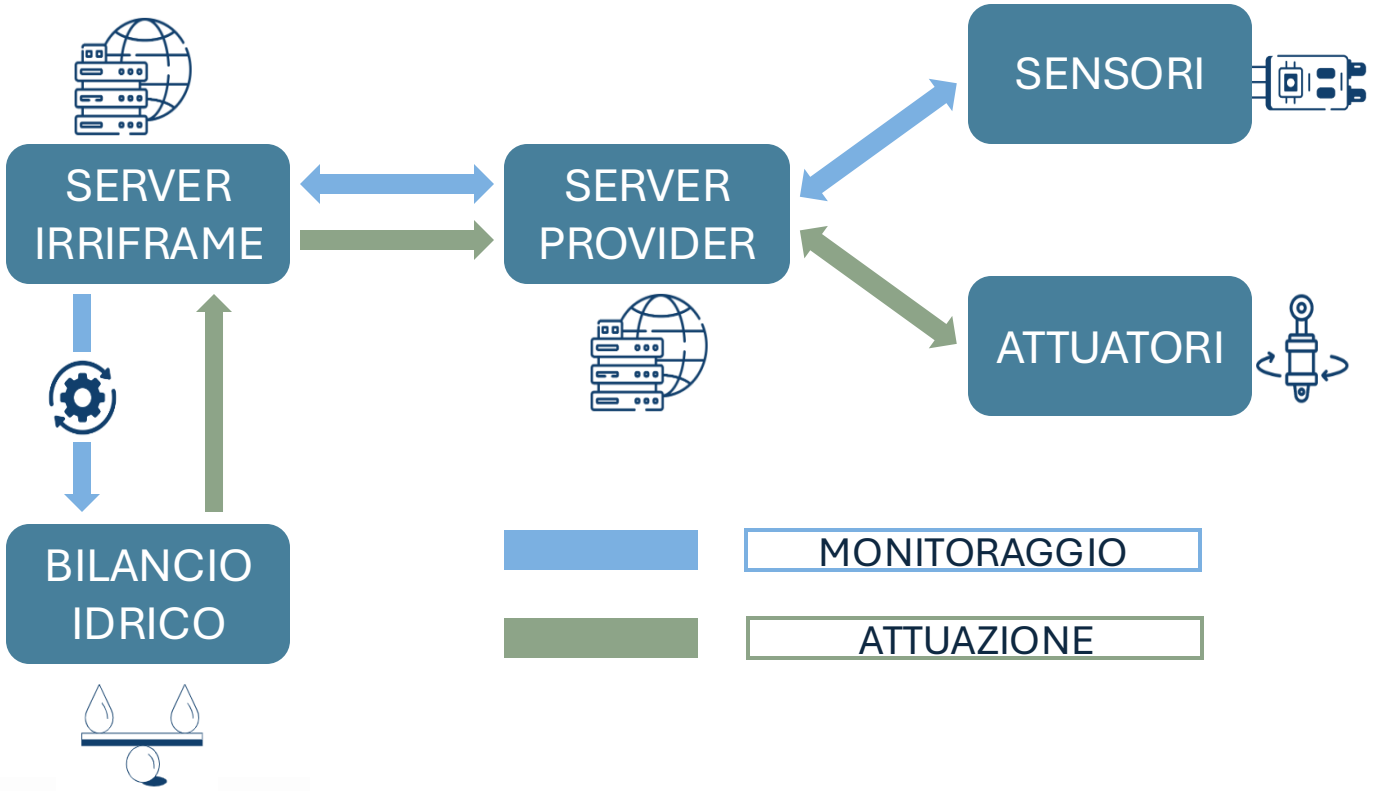
# Research and innovation on irrigation resources - From the field to the DSS and vice versa

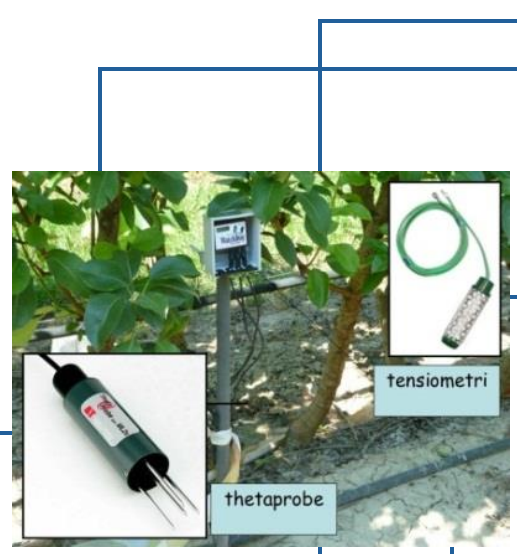
- Soil moisture sensors
- Fruit growth sensors
- Pressure switches/volume meters
- In vivo sensors (SapFlow, TreeTalker, ...)

Irriframe
IL PORTALE DELL'IRRIGAZIONE



# Research and innovation on irrigation resources - From the field to the DSS and vice versa

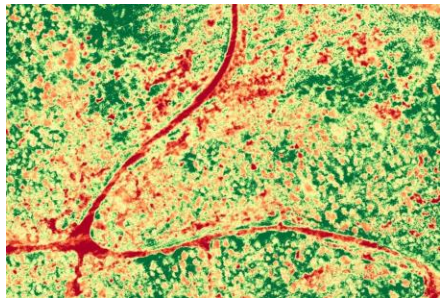


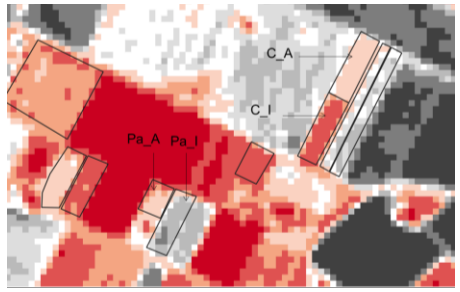





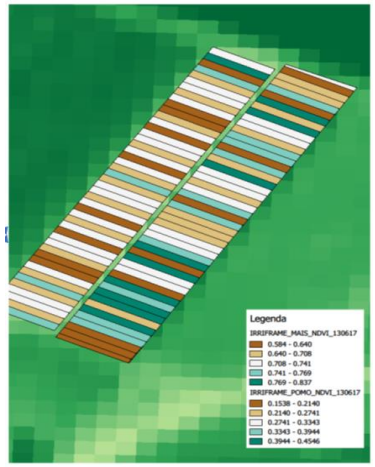
# VRI: Variable Rate Irrigation

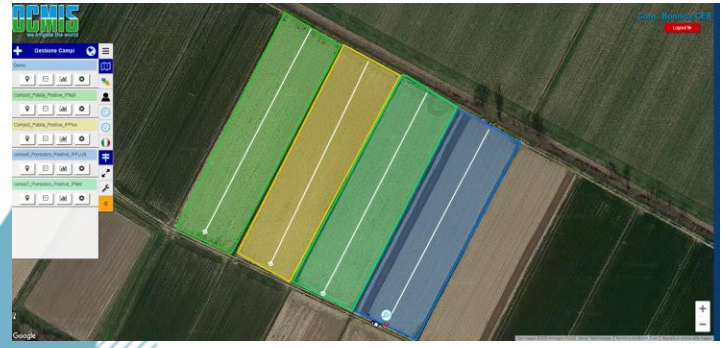
SAT Positive Server



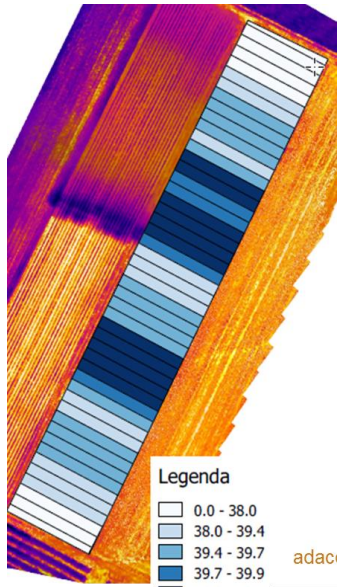



Positive Server



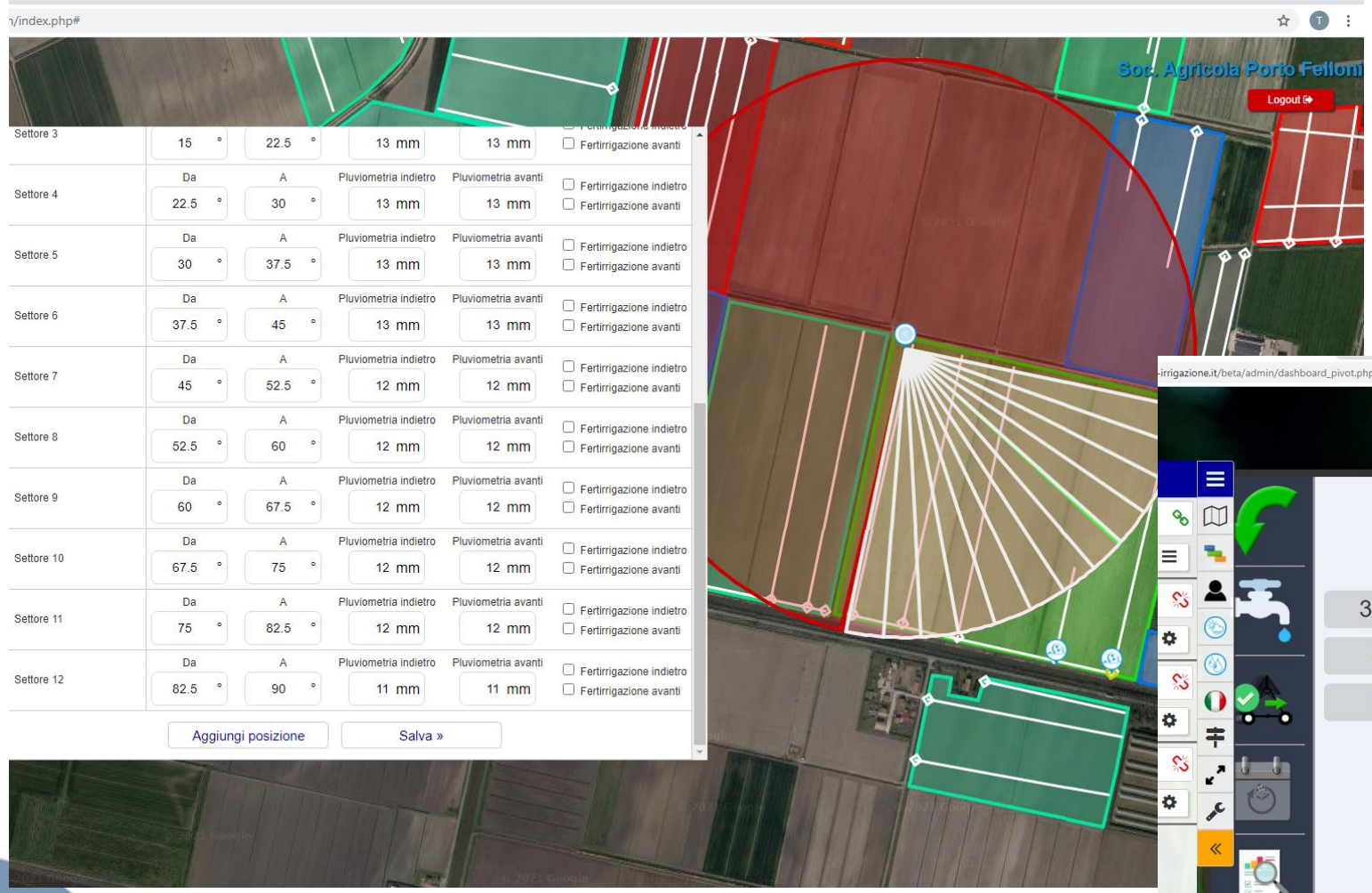
OCMIS we irrigate the world

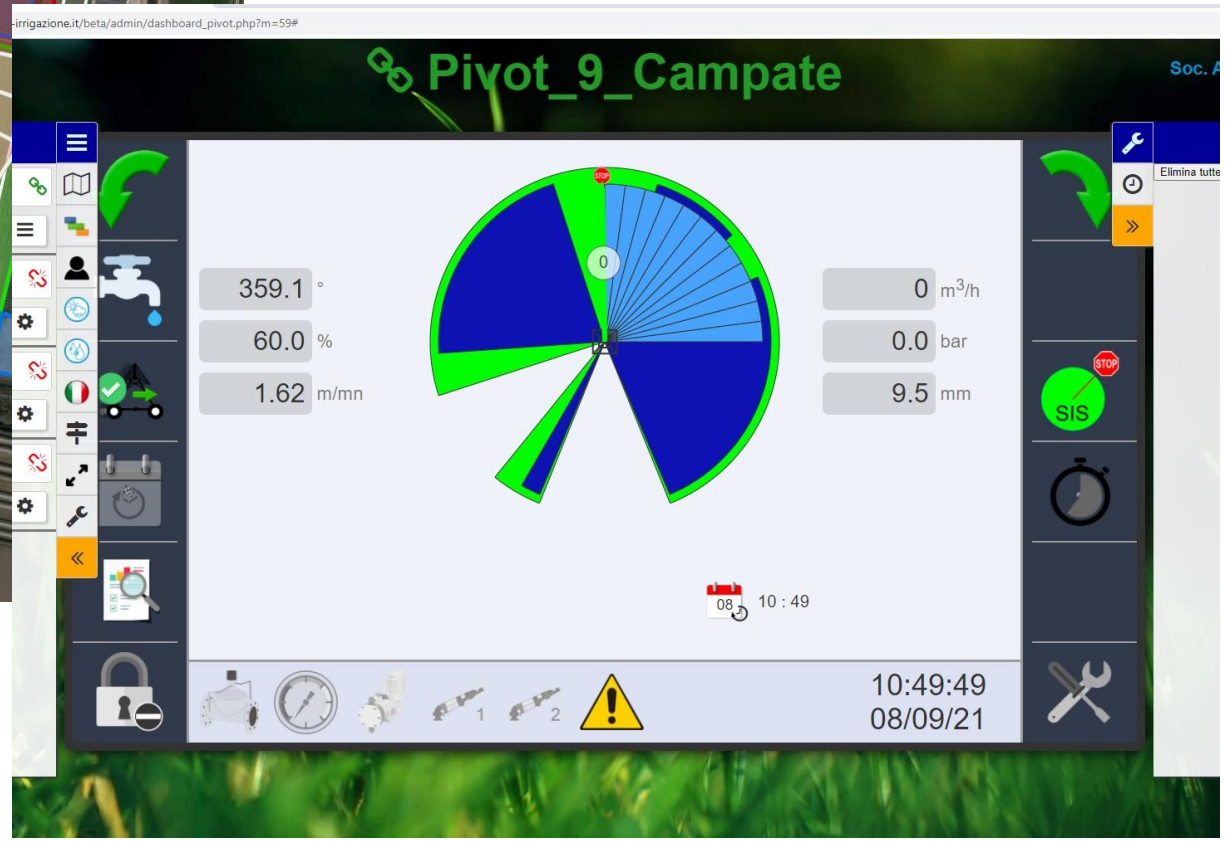



Irriframe
IL PORTALE DELL'IRRIGAZIONE
ANBI

# VRI: Variable Rate Irrigation

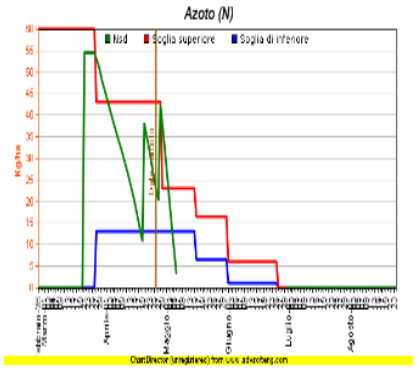
## ADVANCED AUTOMATION OF SPRINKLER IRRIGATION and VRI



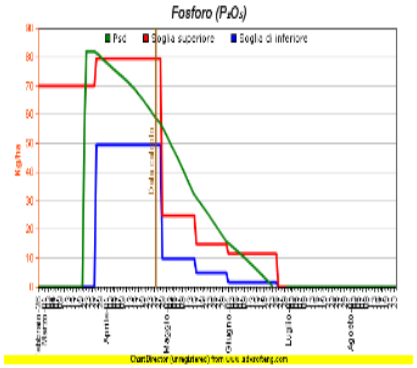
# ADVANCED AUTOMATION OF IRRIGATION AND FERTIRRIGATION SYSTEM

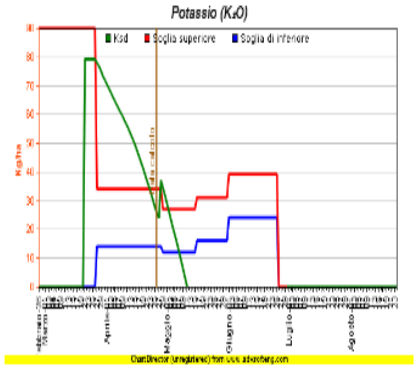
Cloud service




Registro fertilizzazioni >

Irriframe
IL PORTALE DELL'IRRIGAZIONE





# Thank you for the attention

Canale
Emiliano
Romagnolo