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Agronomski fakultet

University of Zagreb
Faculty of Agriculture

Perspectives and Current State of Irrigation in Croatia

EIA Autumn Irrigation Forum

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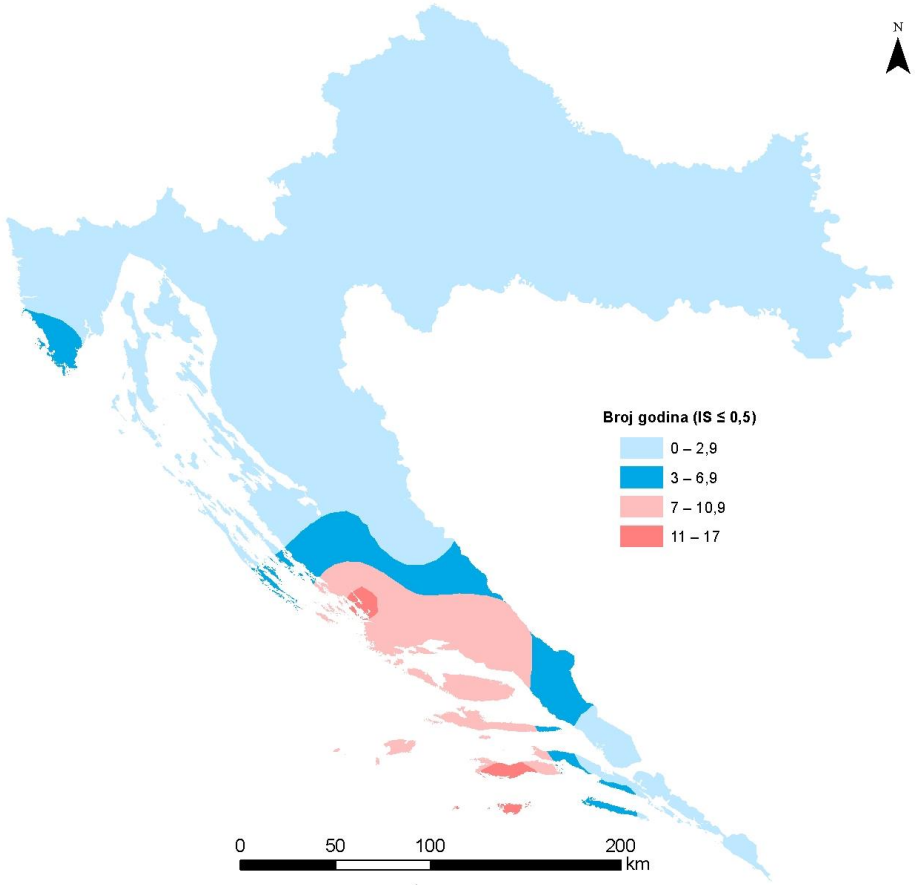
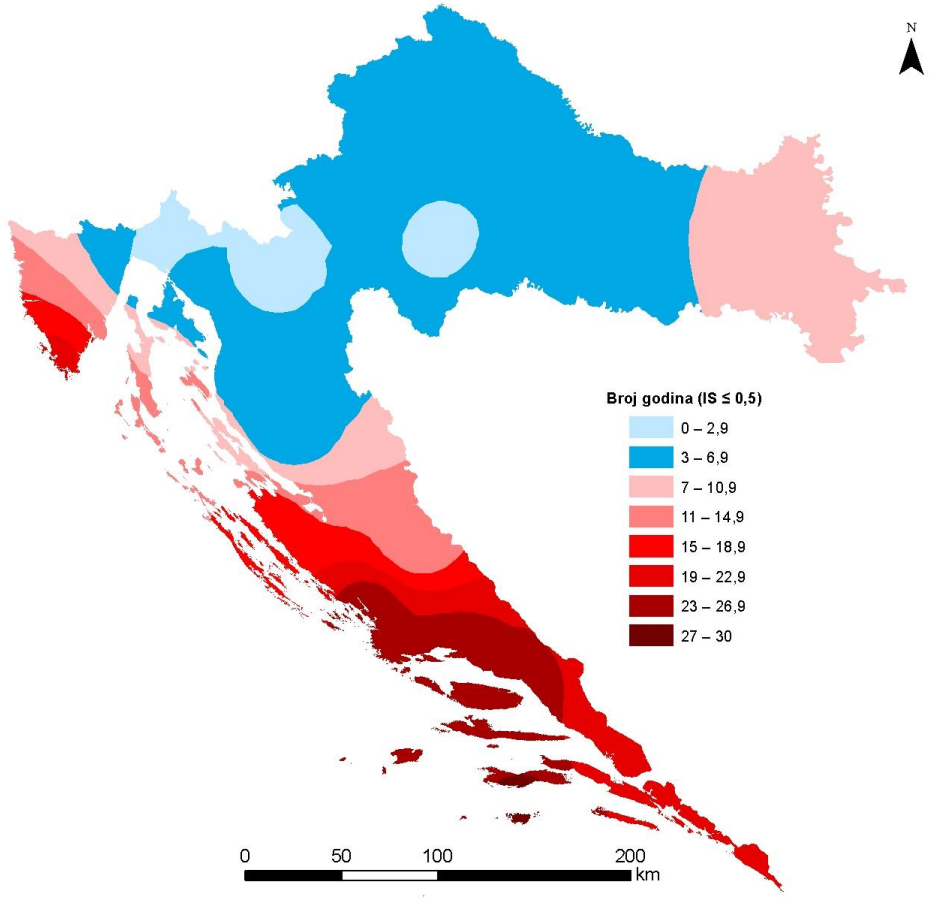
From drought risk to efficient irrigation in Croatia

- Droughts occur on average every 3–5 years in Croatia
- Depending on intensity and duration, they can reduce crop yields by 20–92%
- Drought is one of 11 priority risks identified in the national report Disaster Risk Assessment in the Republic of Croatia (Government of the Republic of Croatia, 2019).
- 2005–2017: drought accounted for an average of 30% of all reported losses from natural hazards;
- in 2007, 2011, 2012, and 2015 the share exceeded 60%

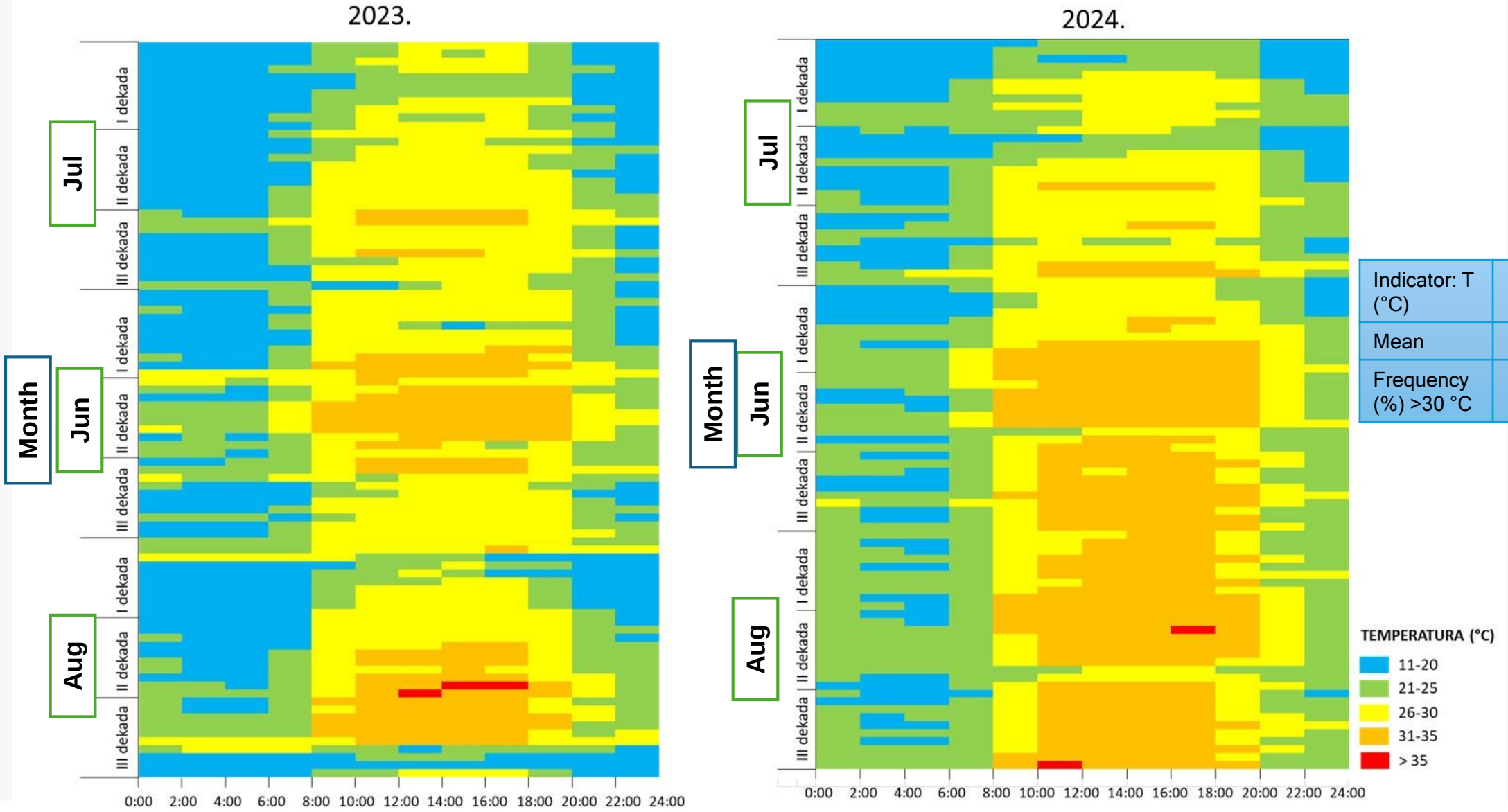
Climate criteria – dryness - aridity index (AI =P/PET) - Teeres et al. (2016)



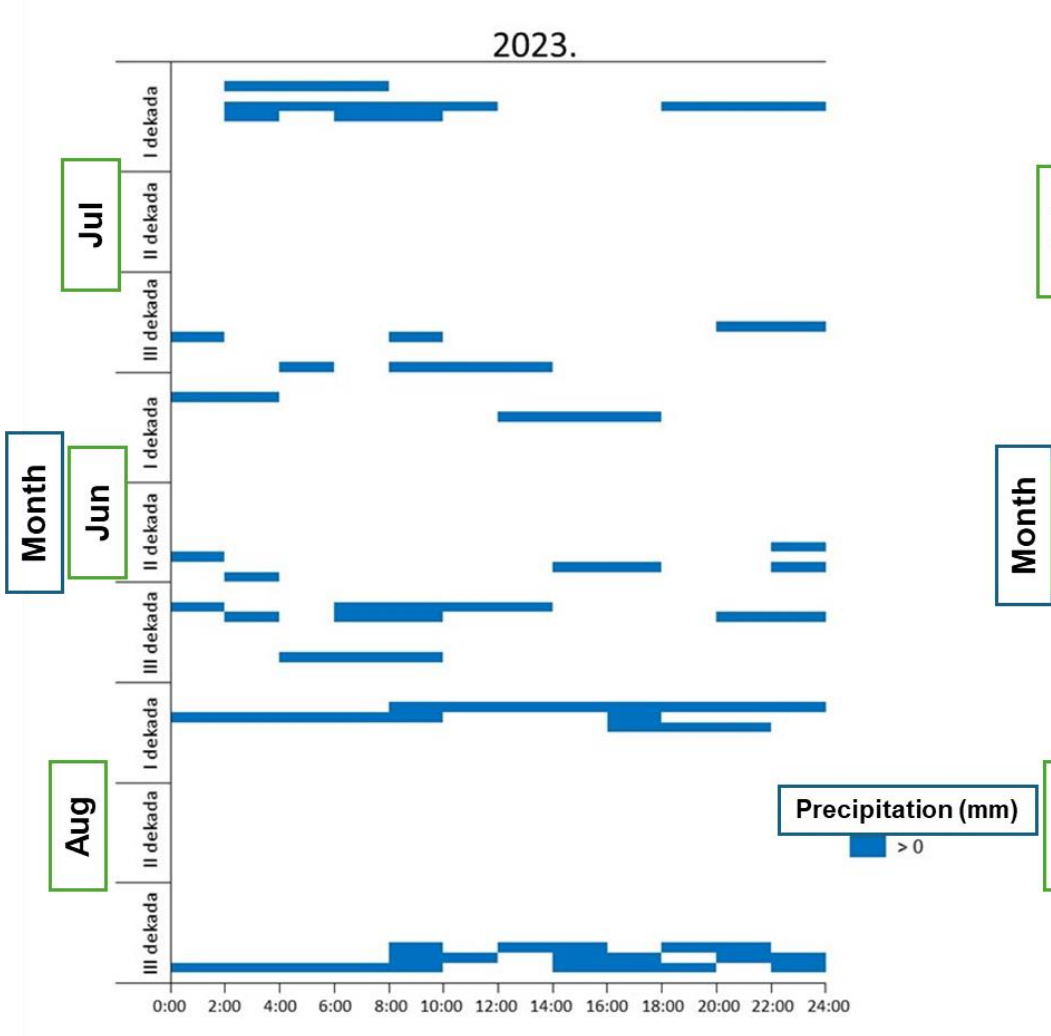
Map of Areas facing Natural Constraints (drought-related ANC), based on the number of years with a drought index ≤ 0.5 (1988–2017)

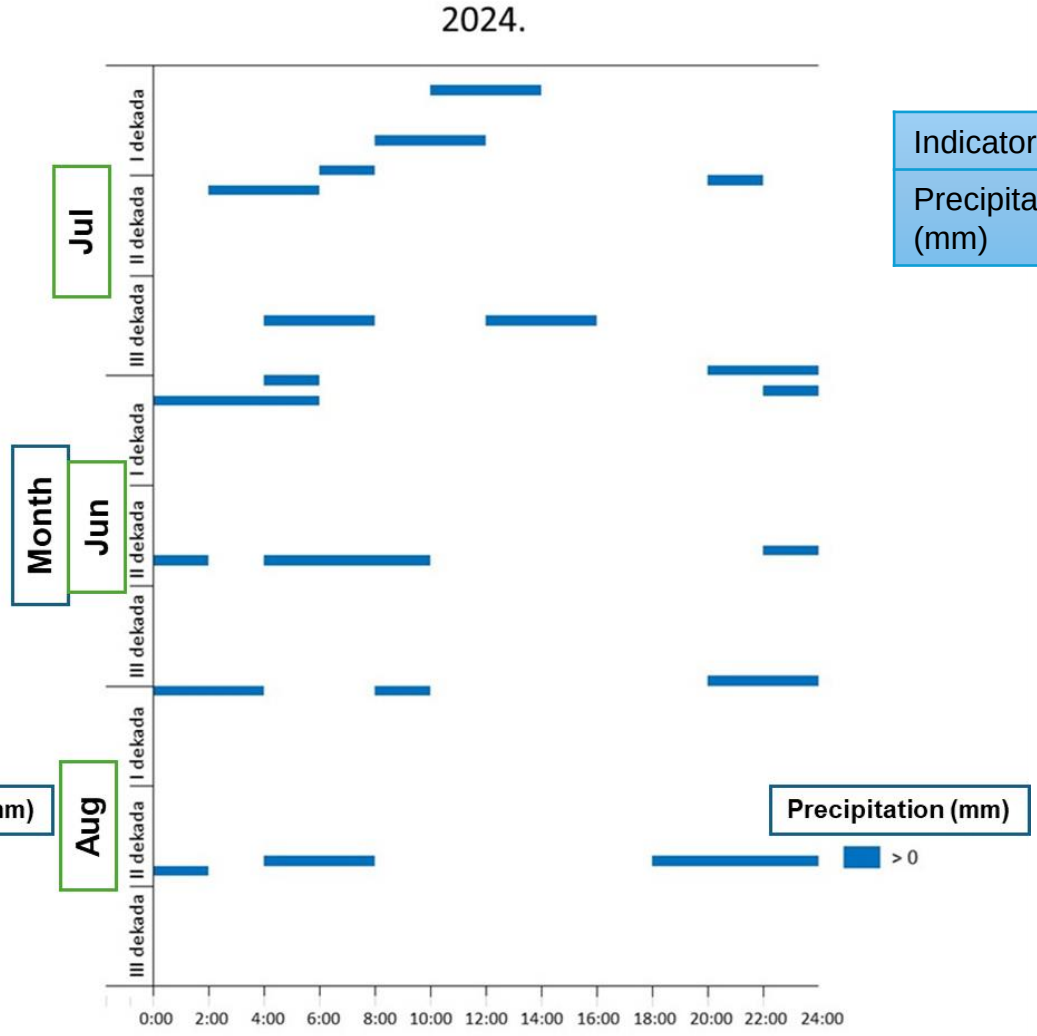


Map of Areas facing Natural Constraints (ANC) due to drought in the **vegetation season**, based on the number of years with a drought index ≤ 0.5 (1988–2017)



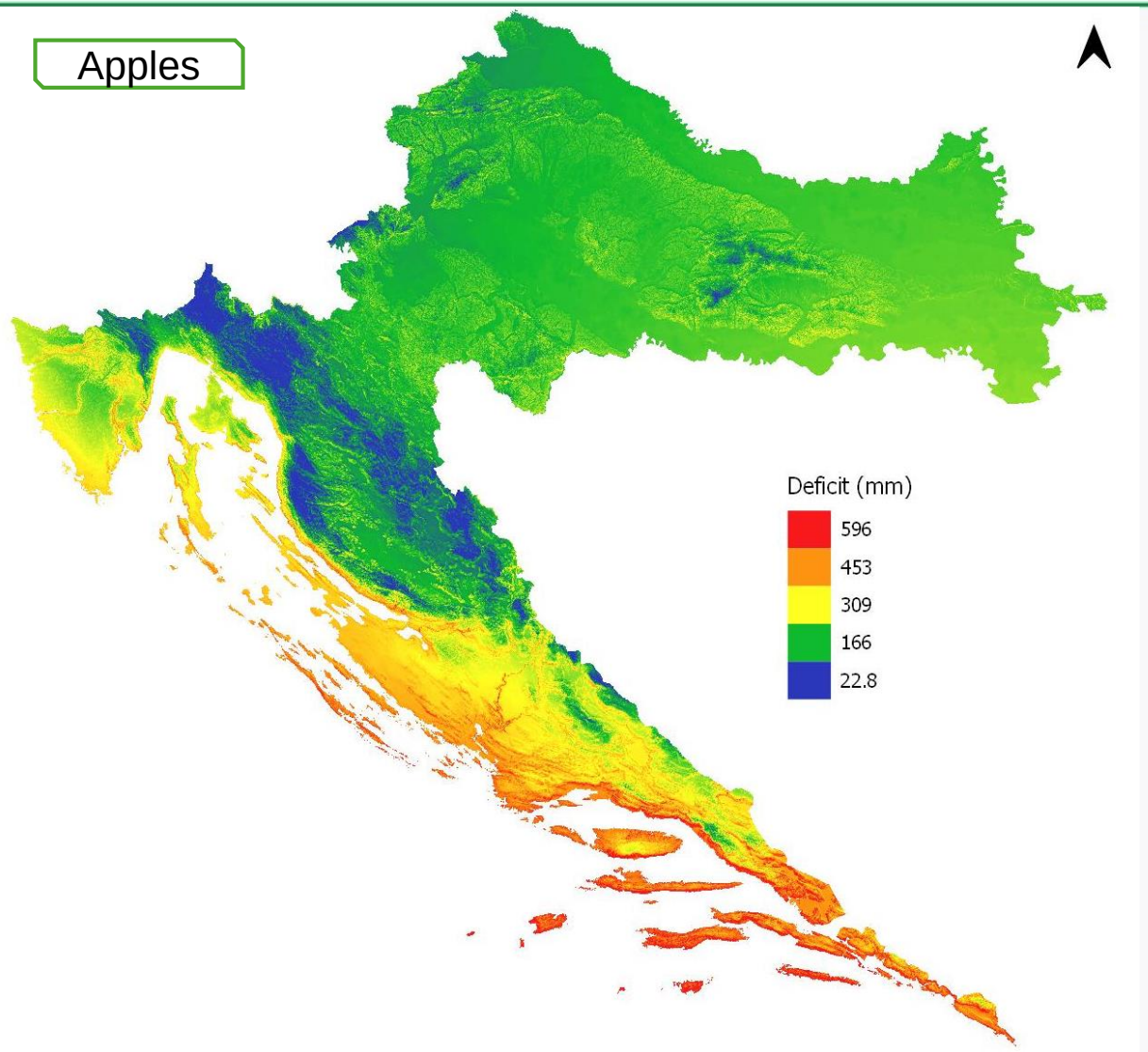
Indicator: T (°C)	2023	2024
Mean	23.8	25.3
Frequency (%) >30 °C	11.9	23.6



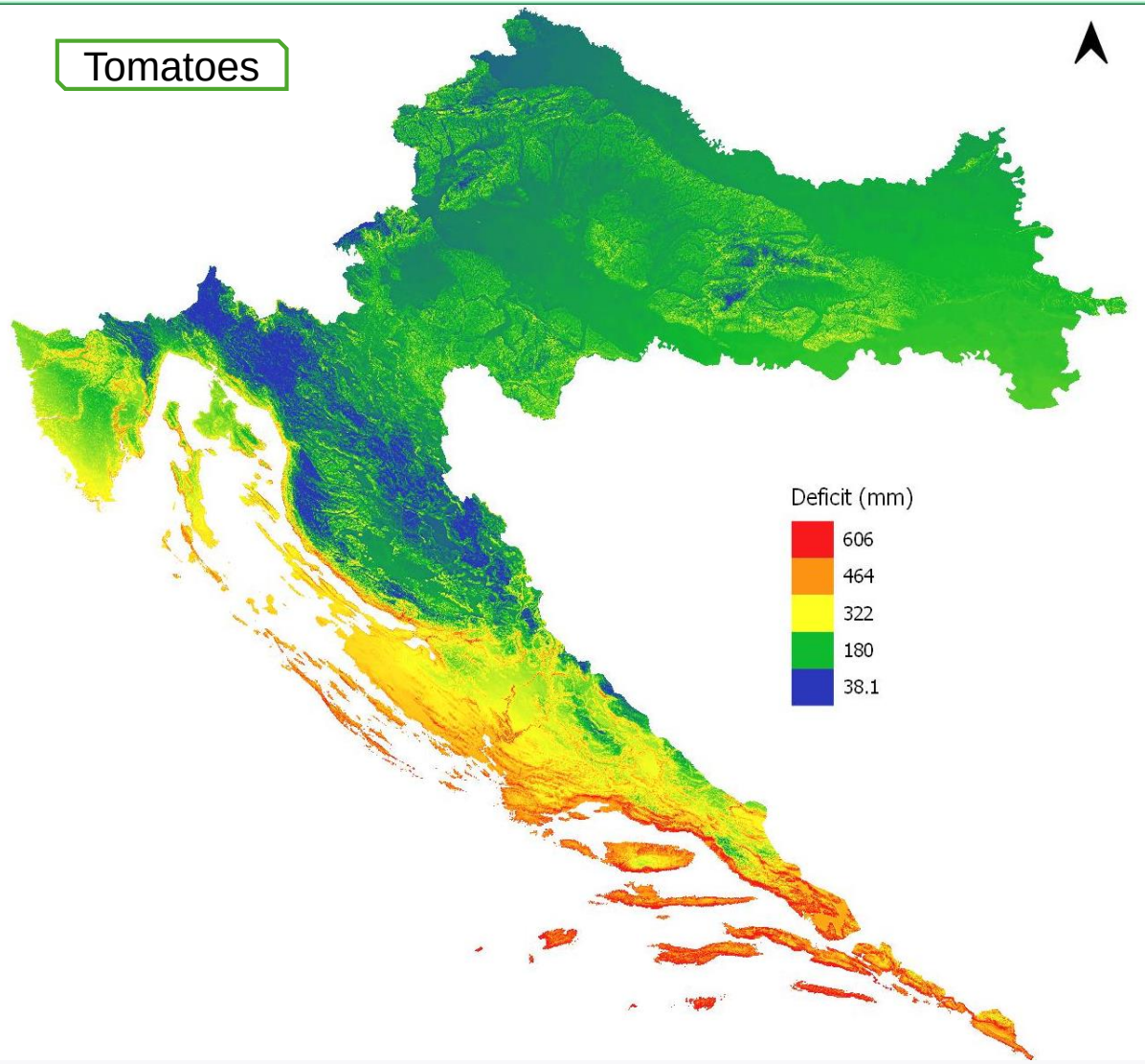


Indicator	2023	2024
Precipitation (mm)	372.9	79.3

Apples

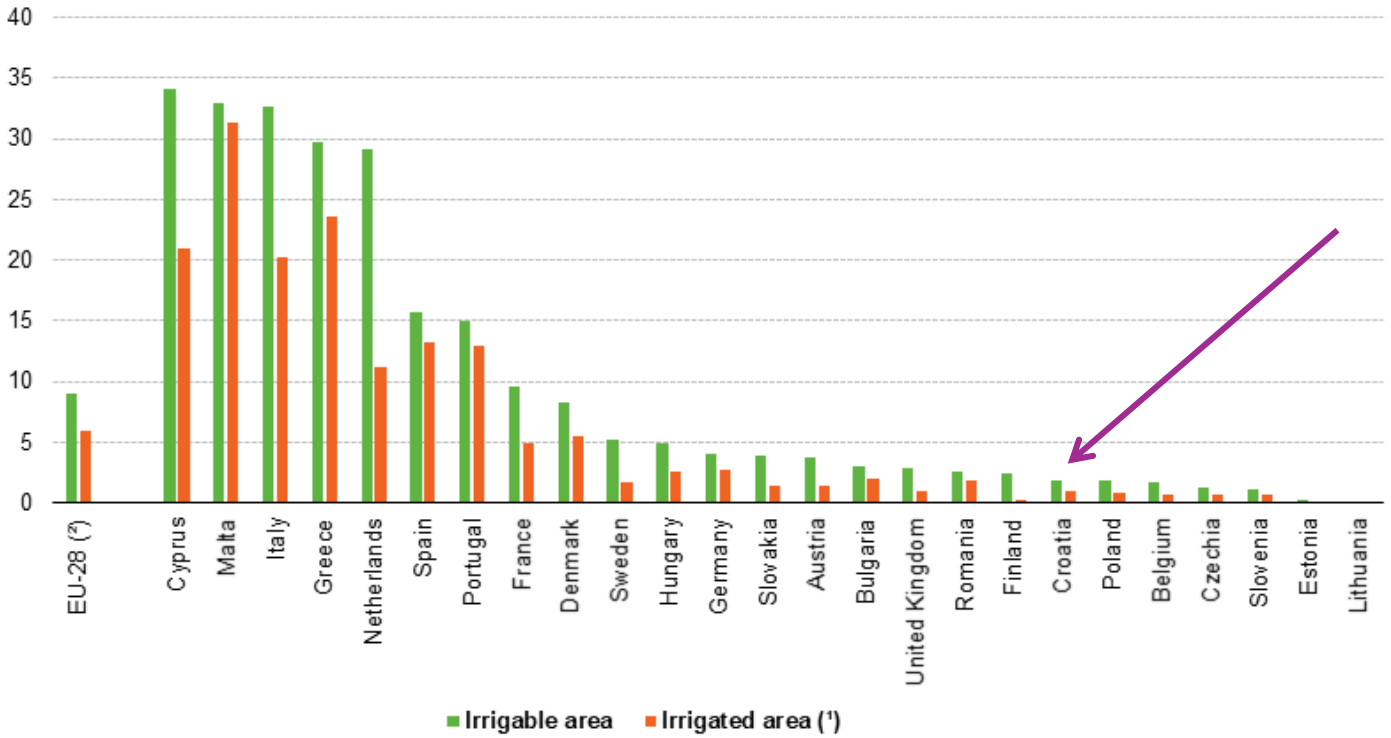


Tomatoes



Water Deficit Maps for Years with Average Precipitation (Universal Kriging, SAGA-GIS)

Share of irrigable and irrigated areas in UAA, EU-28, 2016
(% of total UAA)



(¹) Irrigated at least once a year; kitchen gardens and area under glass excluded.
(²) Luxembourg excluded as data are not available.

Note: Ireland: data not existing; Latvia: data not significant; Luxembourg: data not available.

Source: Eurostat (online data code: ef_poirrig))

eurostat

National Project of Irrigation and Management of Agricultural Land and Water in the Republic of Croatia – NAPNAV (2005; 2021)

- the first document that regulated the management of irrigation
- estimated: 0.9% of irrigated land

Irrigation as a Strategic Goal

Target by 2020

65,000 ha

defined by NAPNAV (public + private systems)

Enabled to date

≈ 30,000 ha

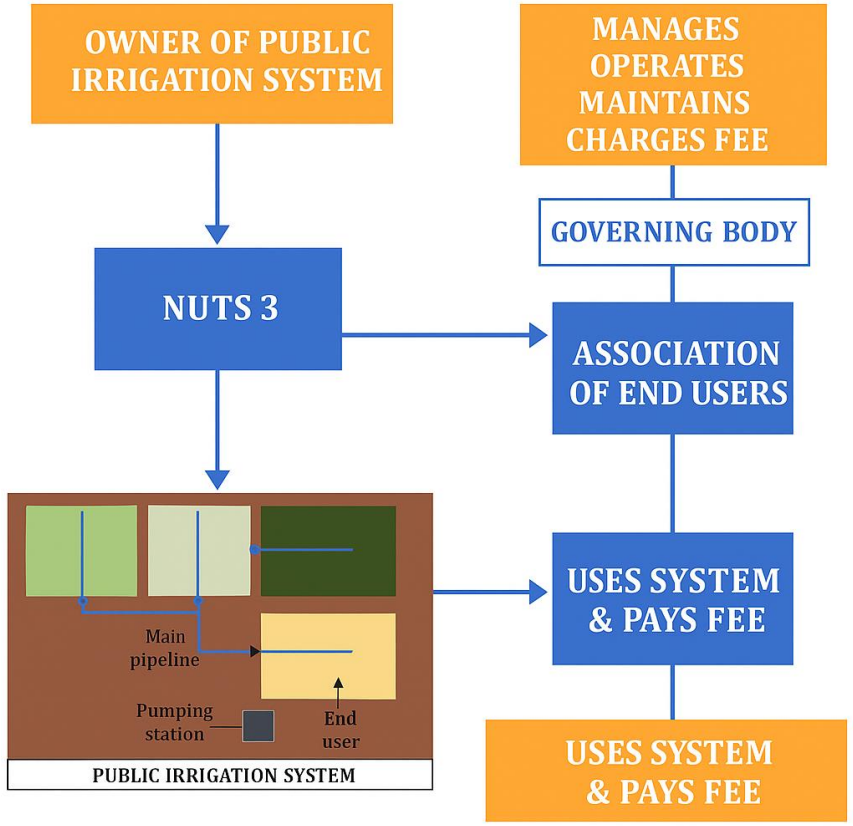
through constructed systems

Estimated private investments

≈ 15,000 ha

investments by private users

Emphasis on Public Irrigation Systems



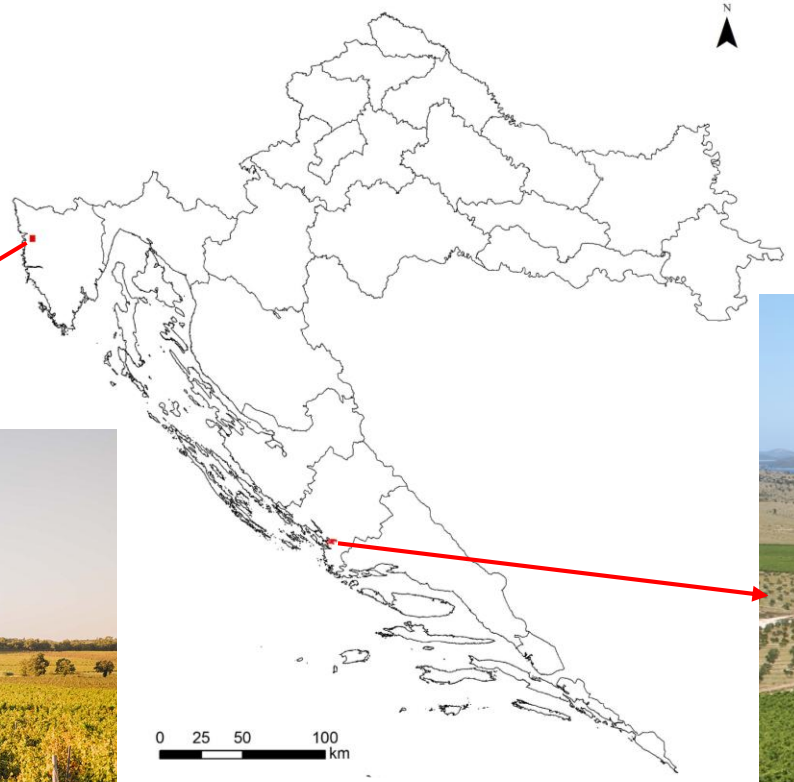
What are the main objectives of national pilot projects?

- Quick feedback on practices
- Investment justification
- Basis for irrigation legislation
- Identification of promising projects
- Capacity building & training
- Testing ecological impacts
- Trial of new irrigation techniques

NATIONAL PILOT IRRIGATION PROJECTS (NPPs)

Anthropogenically modified Typical medium to deep Terra Rossa

NPP „Červar Porat –Bašarinka” in Istrian county

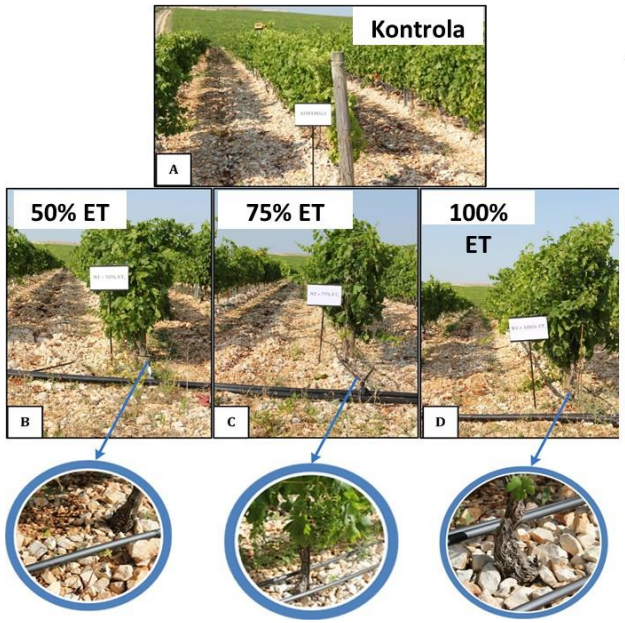


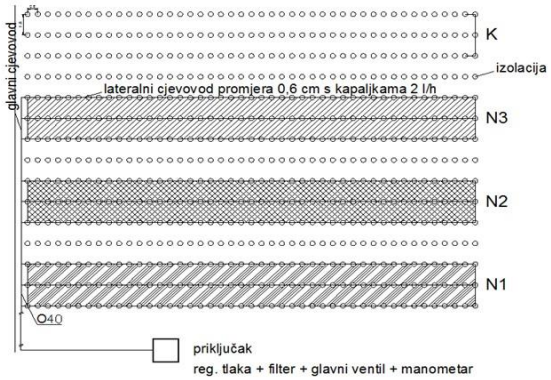
Autochthonous croatian grapevine and olive cultivars

Intensively meliorated (by stone crushing to a depth of 0.6 m) karst stony soil

NPP „Donje Polje – Jadrtovac” in Šibenik–Knin county

Experimental Design of Irrigation Trials in NPPs



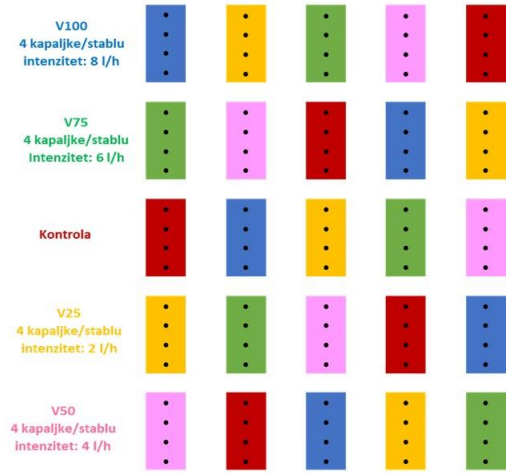


NPP „Donje Polje – Jadrtovac" in Šibenik–Knin county

Dizajn pokusa u obuhvatu Červar Porat Bašarinka - Agrolaguna

V100 – dvije cijevi, intezitet kapanja 1,6 l/h, razmak kapaljki 0,3 m
V75 – dvije cijevi, intezitet kapanja 1,6 l/h, razmak kapaljki na jednoj cijevi 0,3m, a na drugoj cijevi 0,6 m
KONTROLA
V50 – jedna cijev, intezitet kapanja 1,6 l/h, razmak kapaljki 0,3 m
V25 – jedna cijev, intezitet kapanja 1,6 l/h, razmak kapaljki 0,6 m

Vinograd - Malvazija istarska

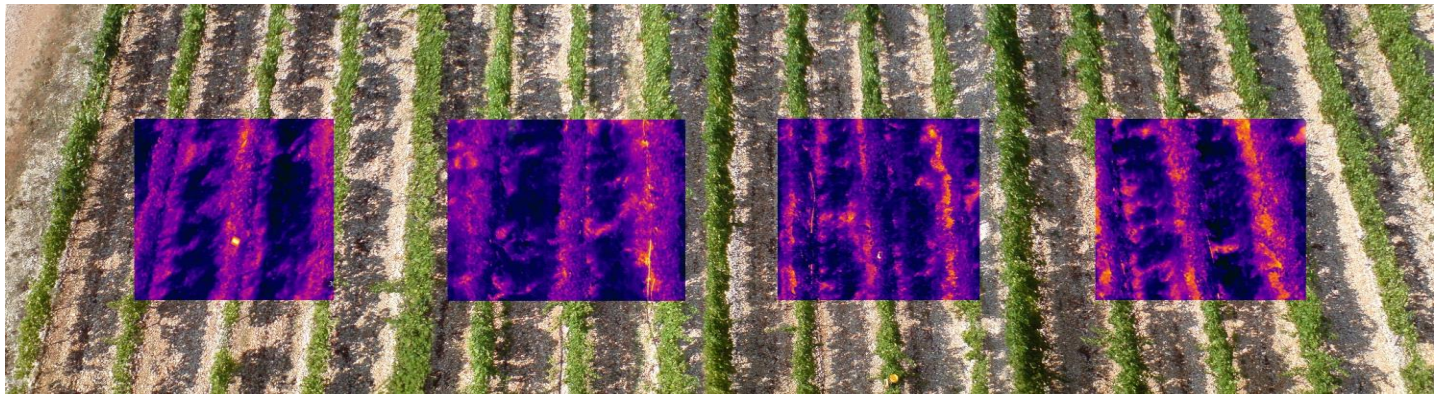


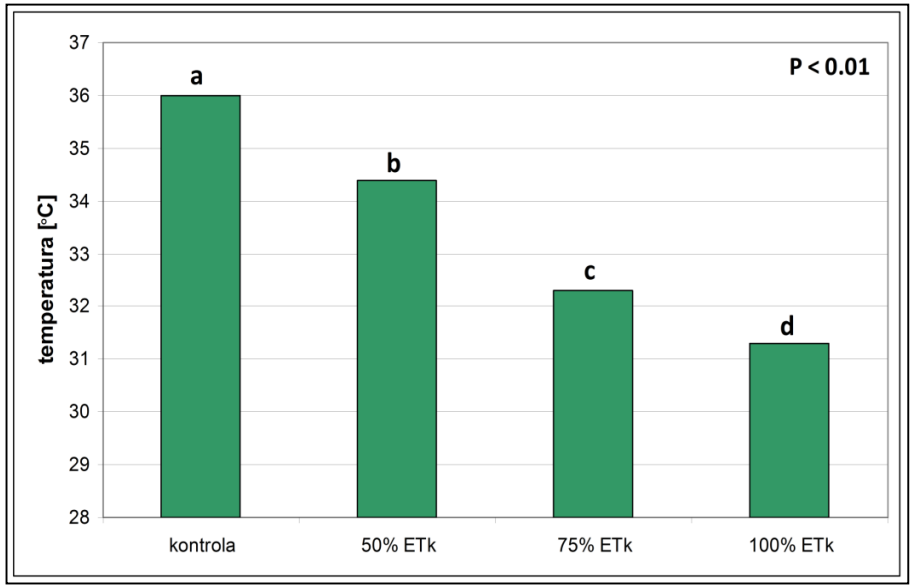
Maslinik

NPP „Červar Porat –Bašarinka" in Istrian county

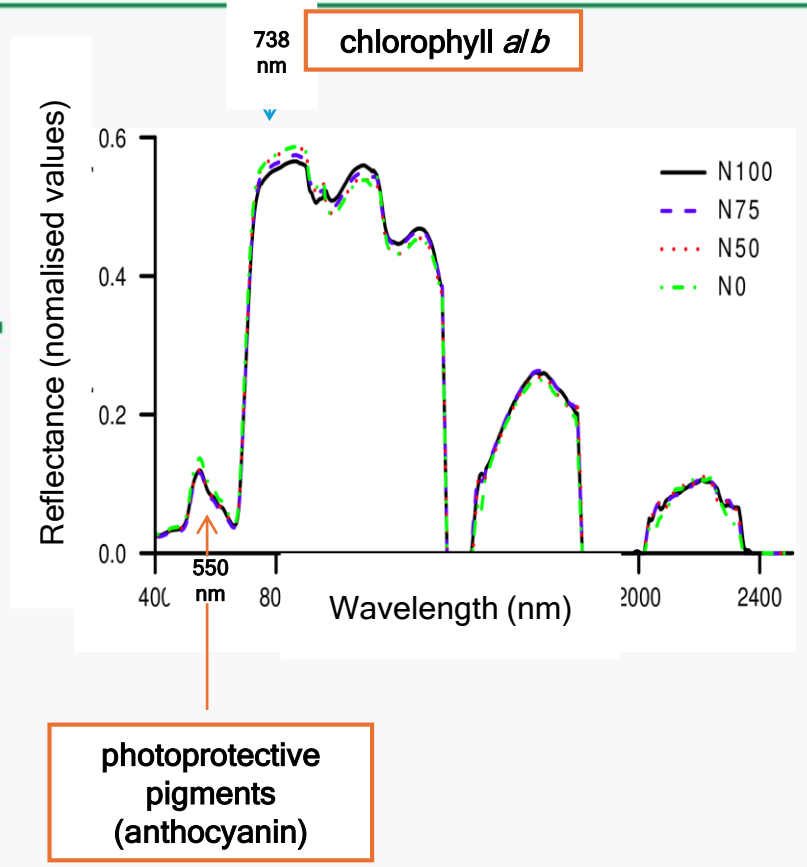
Drip irrigation was scheduled daily from vine/olives ETc, computed using high-density data from the on-site automated weather station and managed via a web-based controller

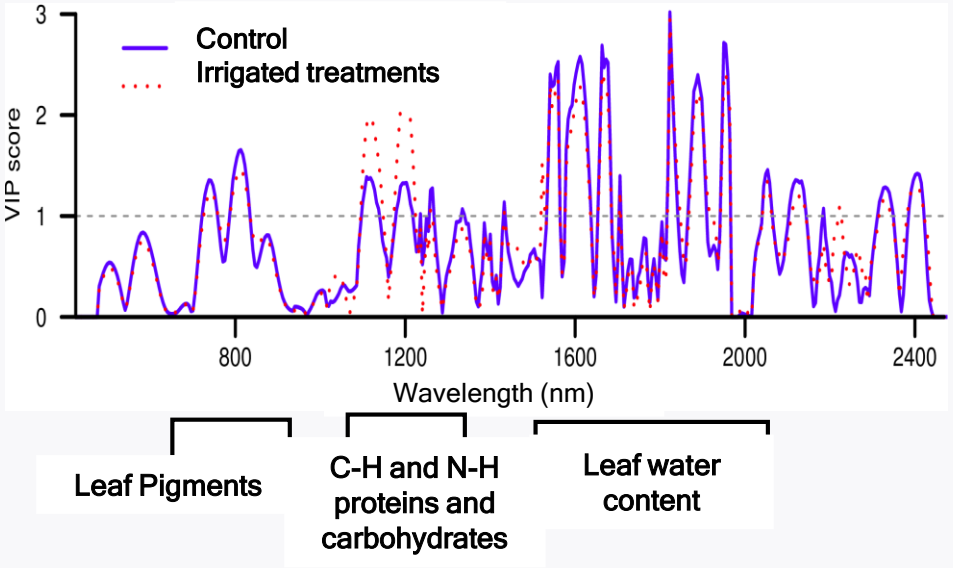
Remote, proximal and in -situ technique to asses within vineyard variability



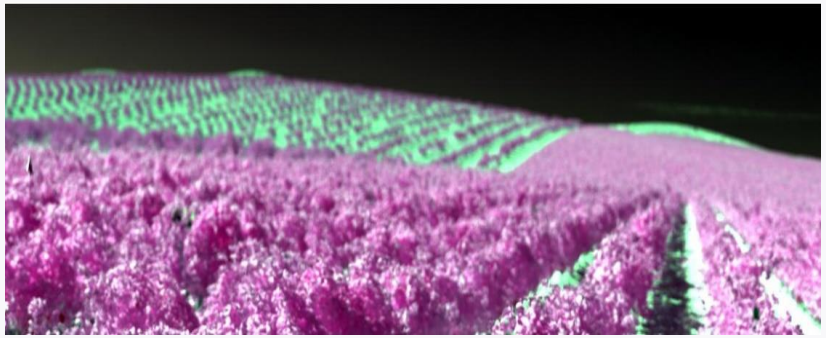


The average canopy temperature

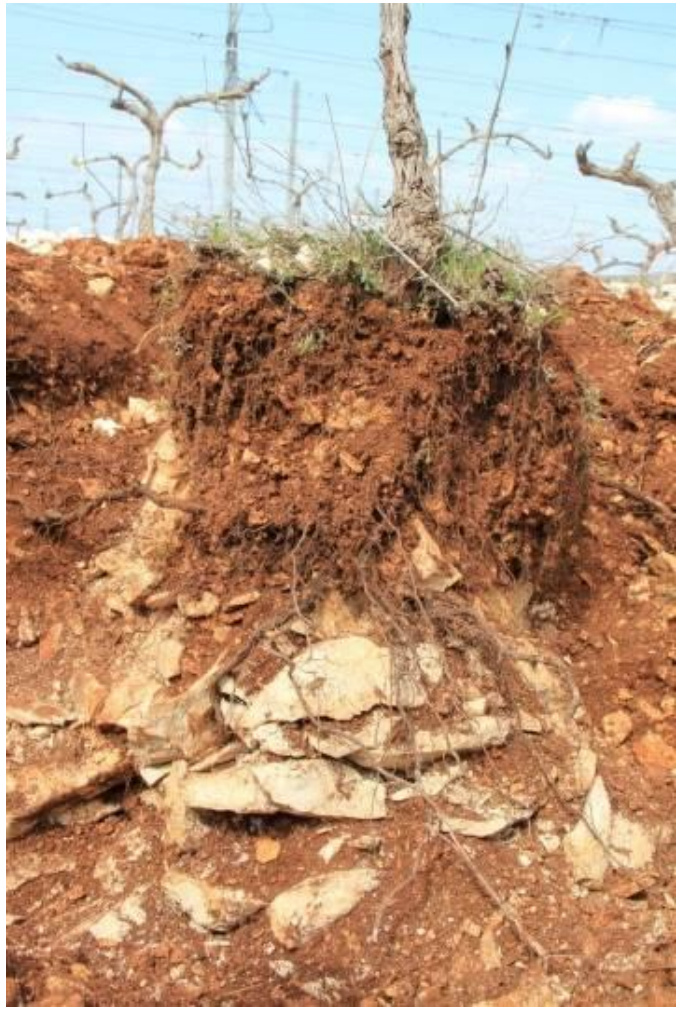




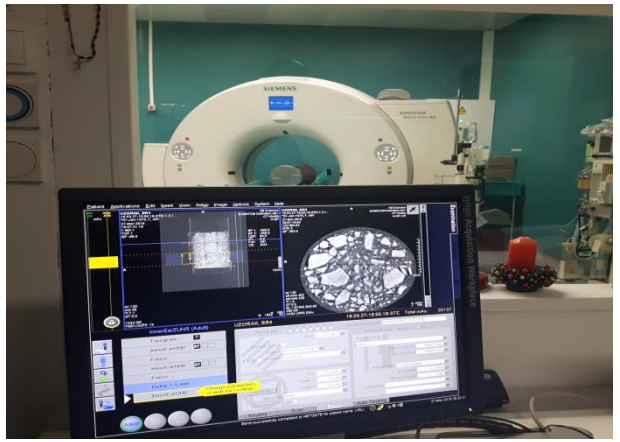
Hyperspectral scanning (Norsk Elektro Optikk, Norway),
Collected **448 spectral bands** in the range from 400 to 2500 nm



Zovko M.; Zibrat U.; Knapic M.; Kovacic BM; Romic D. (2019): **Hyperspectral remote sensing of grapevine drought stress,** Precision Agriculture, 20/2 SI (335-347).

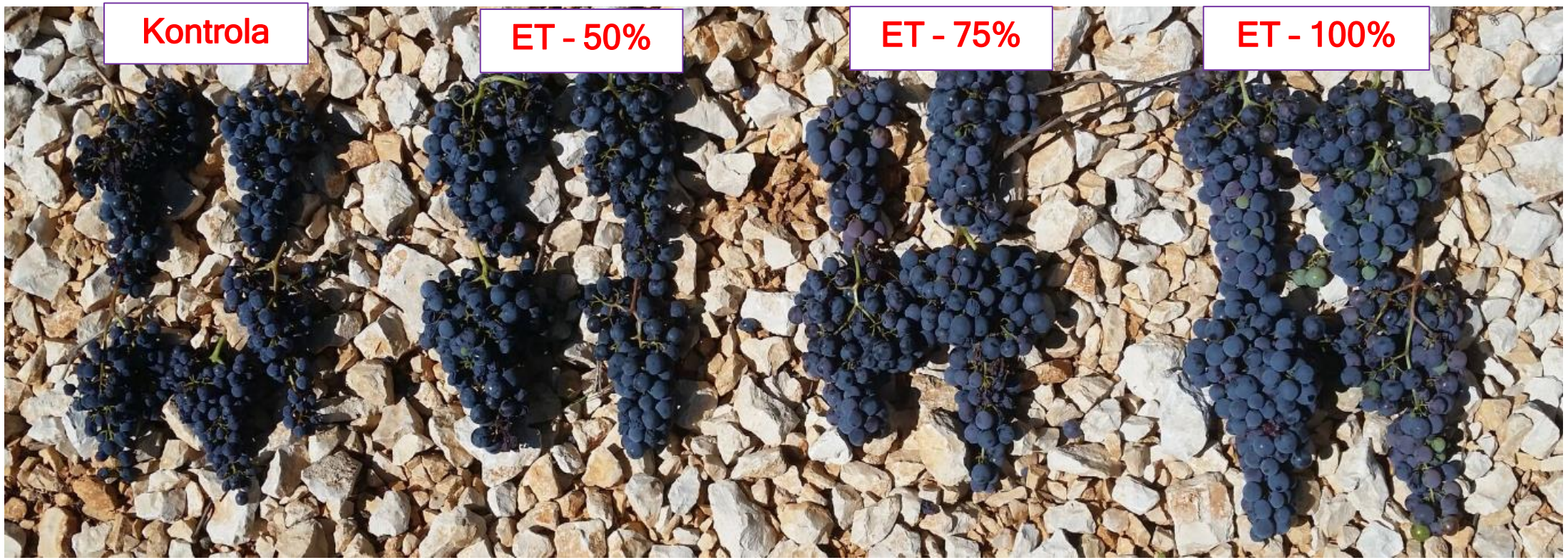


Soil heterogeneity and vine roots development

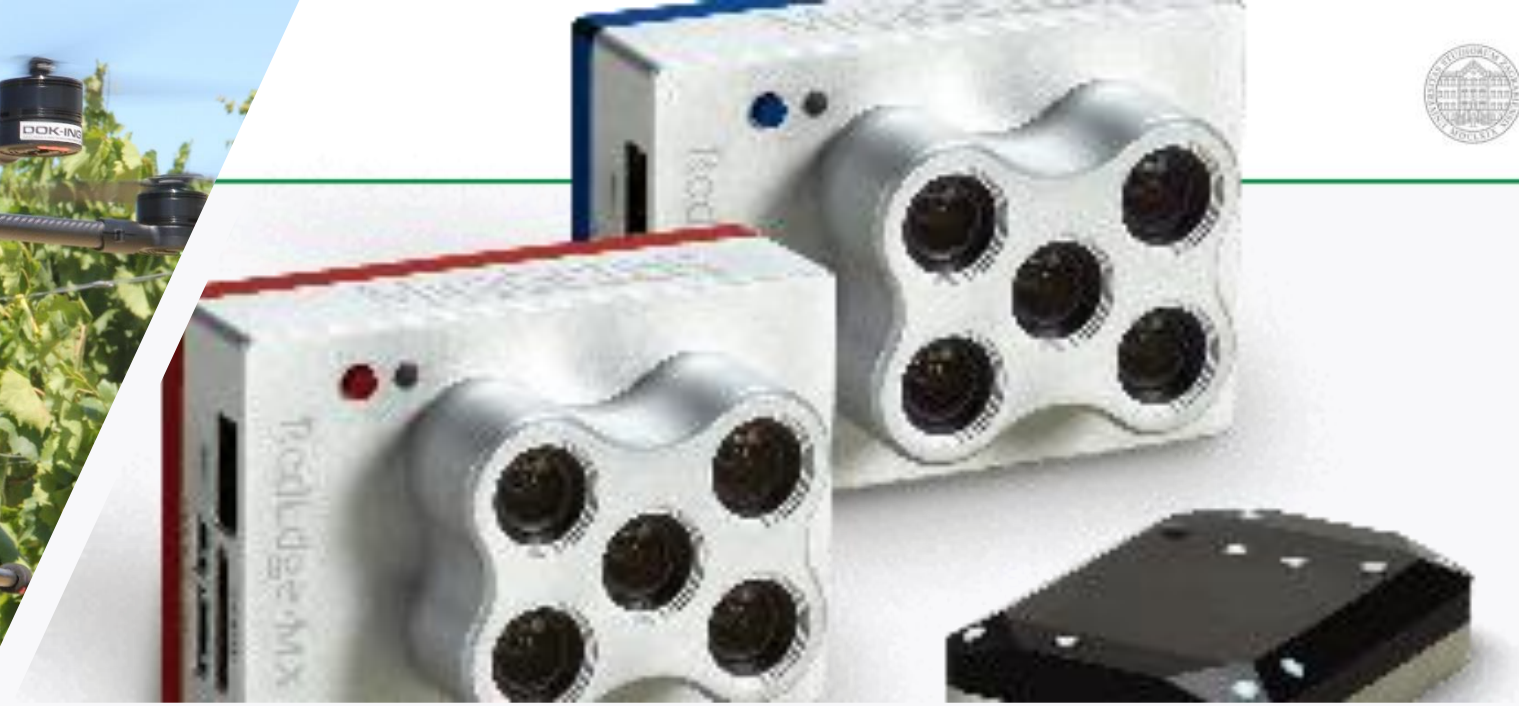


Application of x-ray Computed Tomography (CT)

Appearance of clusters of the autochthonous Croatian grape Babić under different irrigation treatments just before full ripeness




METER TEROS 10 senzor za
temperaturu tla
METER TEROS 21 senzor
potencijal tla



Grape harvesting and vinification according to irrigation treatments in 2024

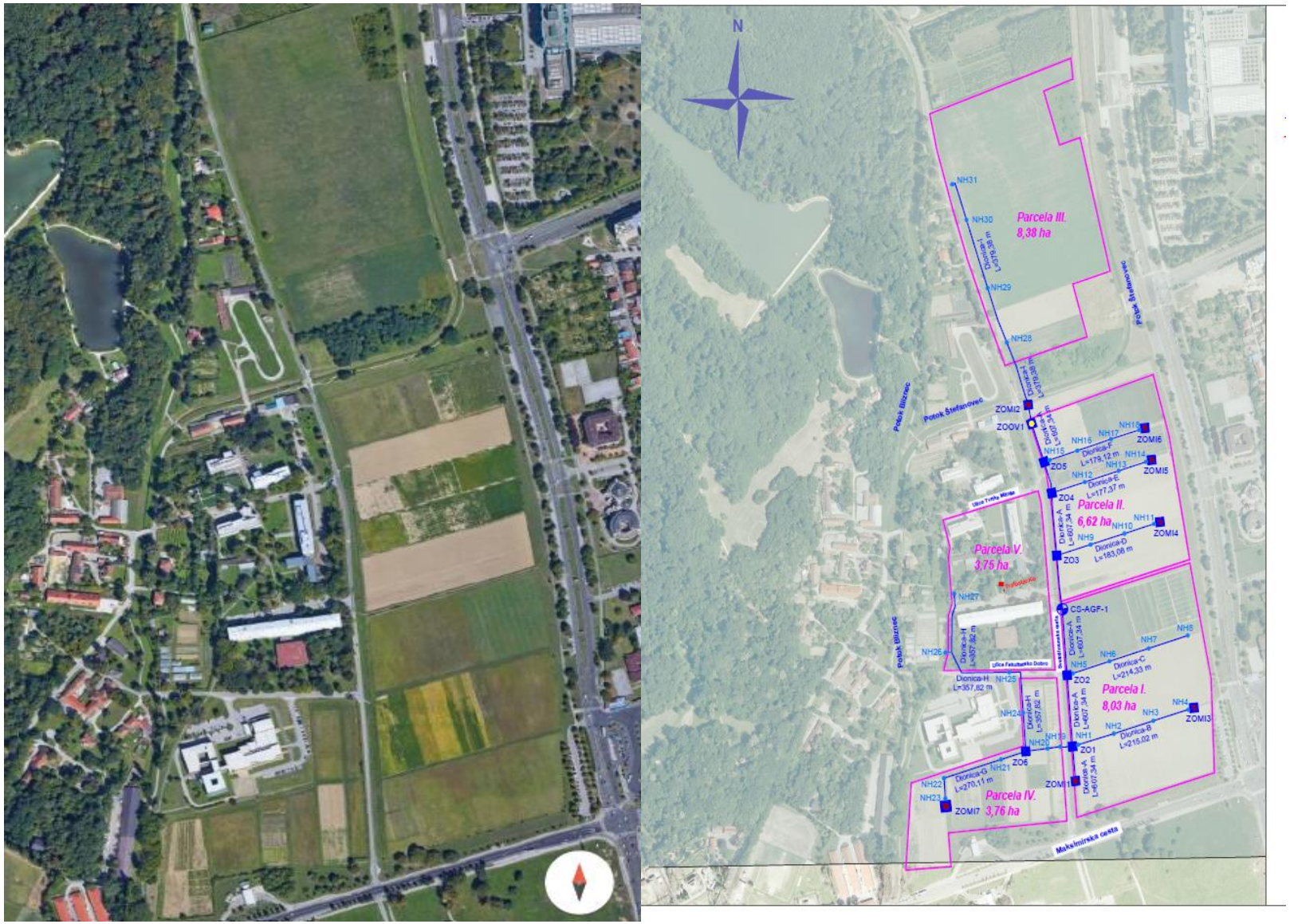



Olive harvest and olive oil processingaccording to irrigation treatments in 2024



Professional blind wine evaluation according to irrigation treatments

A master plan of Irrigation system at the Experimental station Maksimir, University of Zagreb Faculty of Agriculture



Field equipment at Experimental station Maksimir, University of Zagreb Faculty of Agriculture

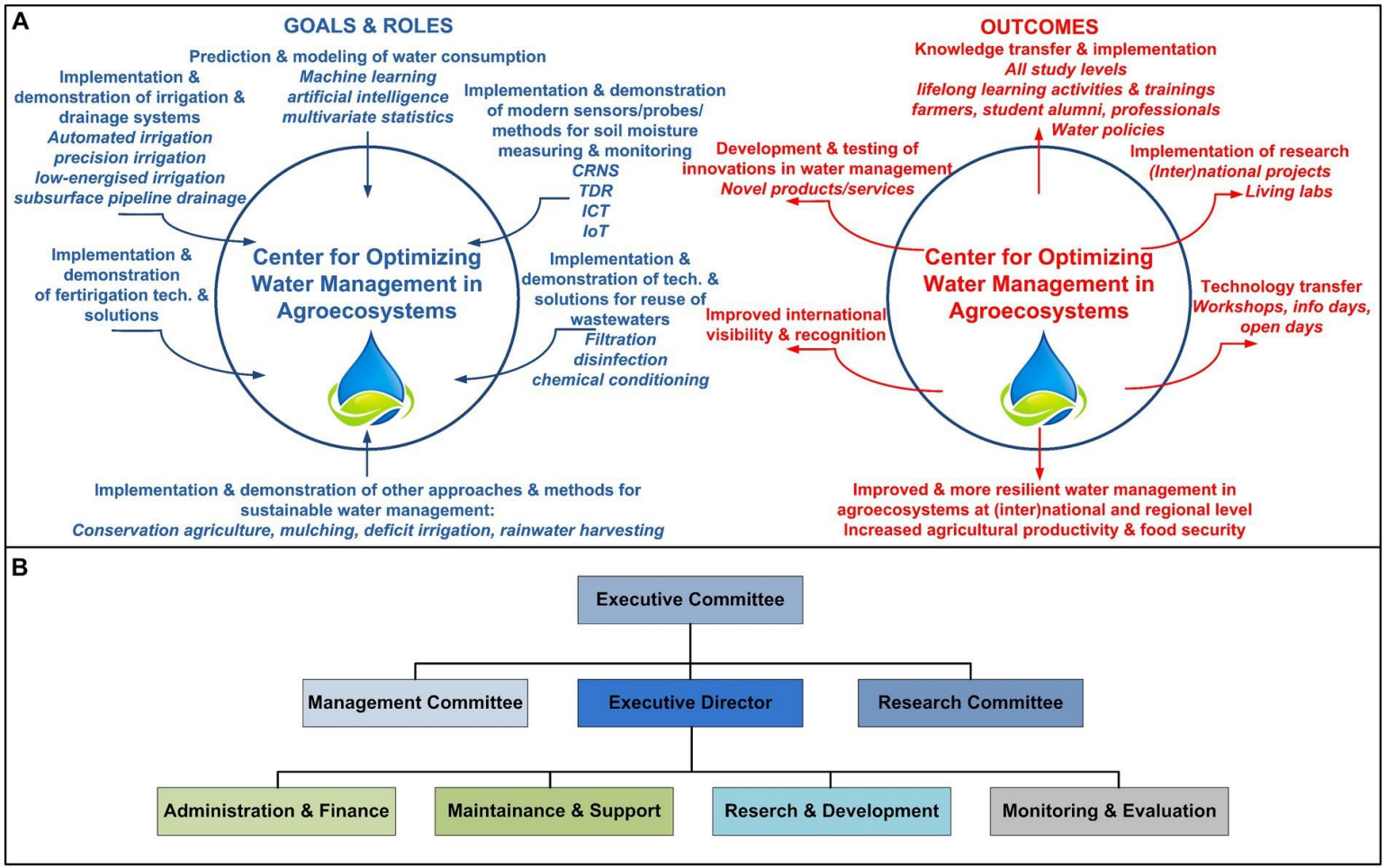
CRNS – Cosmic ray neutron sensor

LI-710 Evapotranspiration Sensor
- 9000-02 IoE Module, includes Base, Tower, and Solar Power

Donated by the International Atomic Energy Agency (IAEA) within the framework of the project RER5028, “Improving Efficiency in Water and Soil Management” (2022–2025)

Centers for optimizing water management in agroecosystems & global food security in the De

Ondrasek G and Rengel Z (2024) Centers for optimizing water management in agroecosystems & global food security. Front. Sustain. Food Syst. 8:1398454.



Conclusions:

- Set up research–education–demonstration hubs as site-specific national pilots for the knowledge/technology transfer and build stakeholder capacity
- integrated smart irrigation: in-situ soil/water sensors, remote sensing and ETc models with decision support at field and scheme level
- Co-design and open data: work with farmers and water managers; publish open datasets (water saved, yield/quality, energy, emissions)
- provide investment guidance, service models for irrigation, and climate-adaptation measures
- Role of the Faculty/University/Institute: knowledge lead, methods validation, and training

Opportunities for Investing in Sustainable Water Management from EU Funds (2028–2034)

- The European Commission has presented its proposal for the **Multiannual Financial Framework (MFF) 2028–2034**, worth **almost €2 trillion**.
- It is estimated that by **2030** around **€255 billion** will be needed to comply with existing **EU water legislation** and improve water-use efficiency across the continent.
- **Key EU instruments:**
- **European Competitiveness Fund:** steers strategic investment in clean technologies and decarbonisation; directly finances uptake of smart-water solutions and infrastructure.
- **Horizon Europe:** supports public–private initiatives to scale solutions and innovations for **sustainable water management**.
- **CAP (Common Agricultural Policy):**
  - **Agri-environment-climate payments:** annual/multi-annual commitments for practices that protect water quality and reduce pressure on resources.
  - **Investment support (for farms and holdings):** productive and non-productive investments that **strengthen the resilience of water supply**.

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