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Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria

Centro di ricerca
Agricoltura e Ambiente

The Capitanata Coastal Irrigation District (CID), Italy

Domenico Ventrella

AI4Water

The context of agriculture in Capitanata

Water: the main limiting factor of agricultural production, in terms of quantity and quality

The Climate Change.

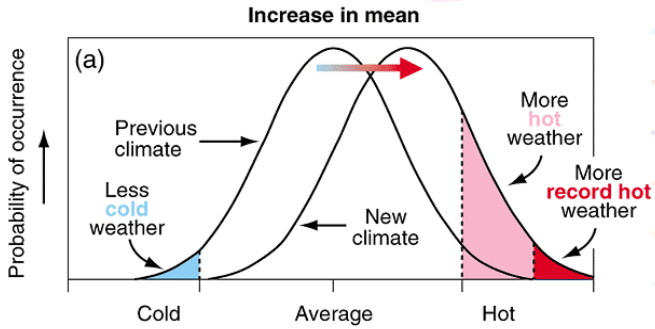
Temperature

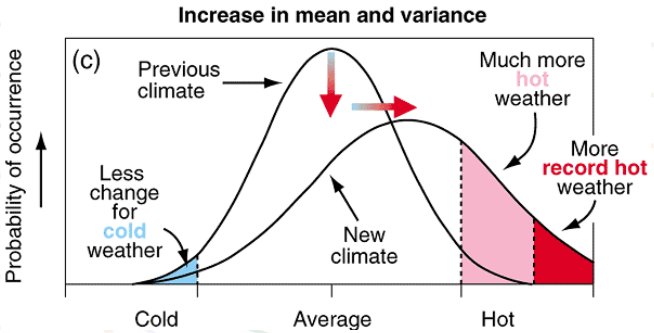
Variations of averages at global scale

Temperature
Rain

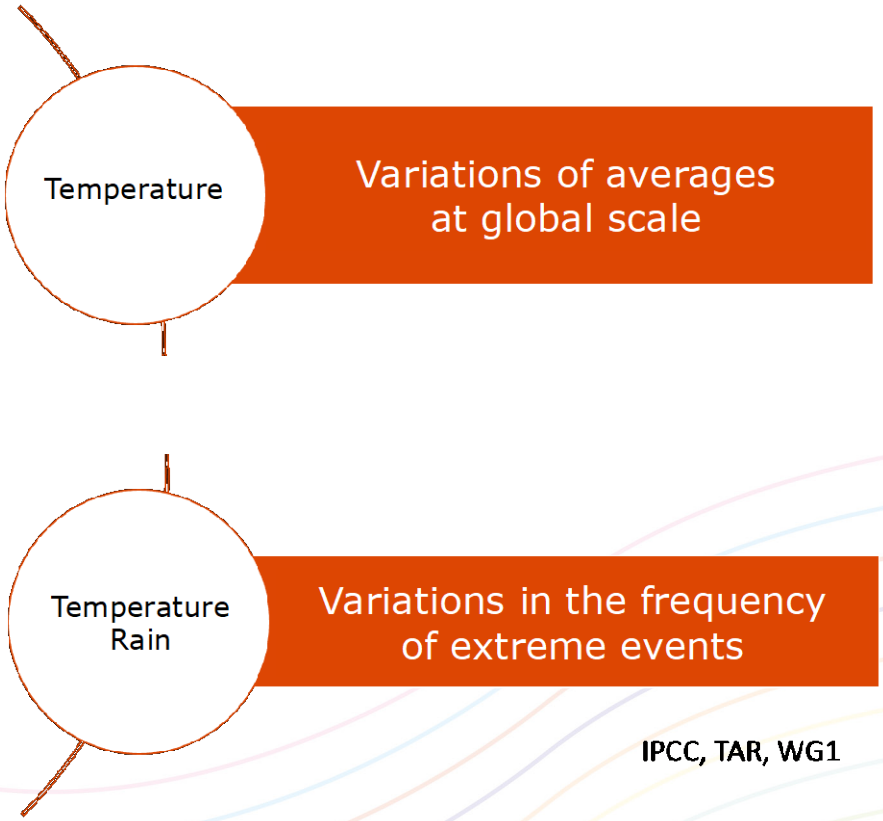
Variations in the frequency of extreme events

IPCC, TAR, WG1





The effects of Climate Change



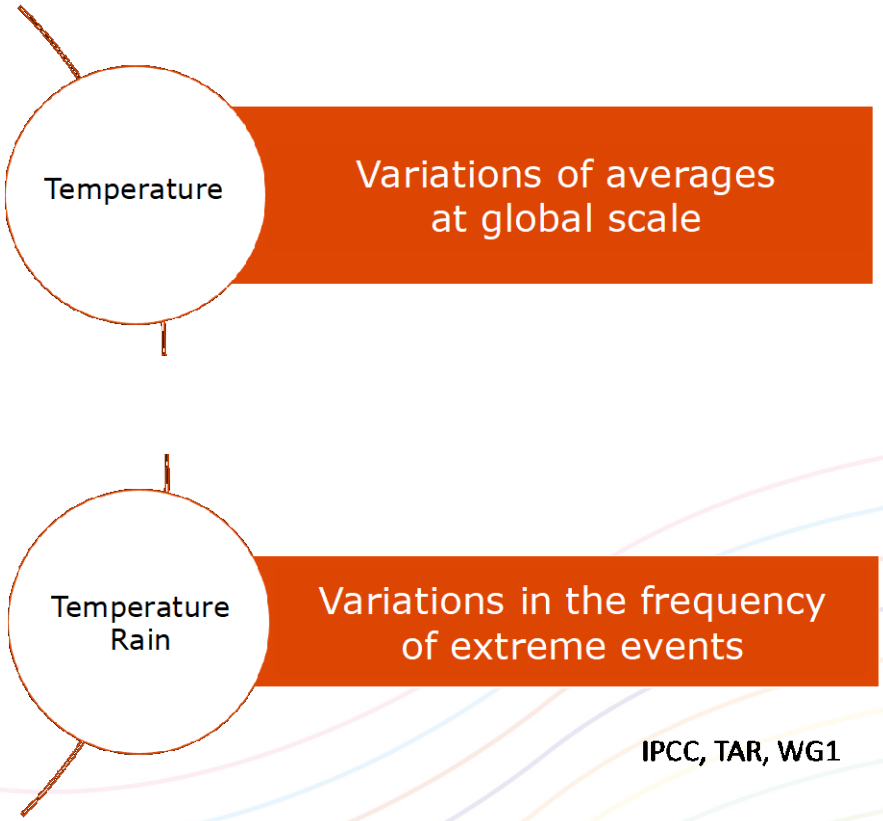
IPCC, TAR, WG1

Temperature: increase at global and seasonal scale

Increase in the frequency of extreme events due to:

- **Temperature**: late frosts, heat waves
- **Rain**: drought, storms

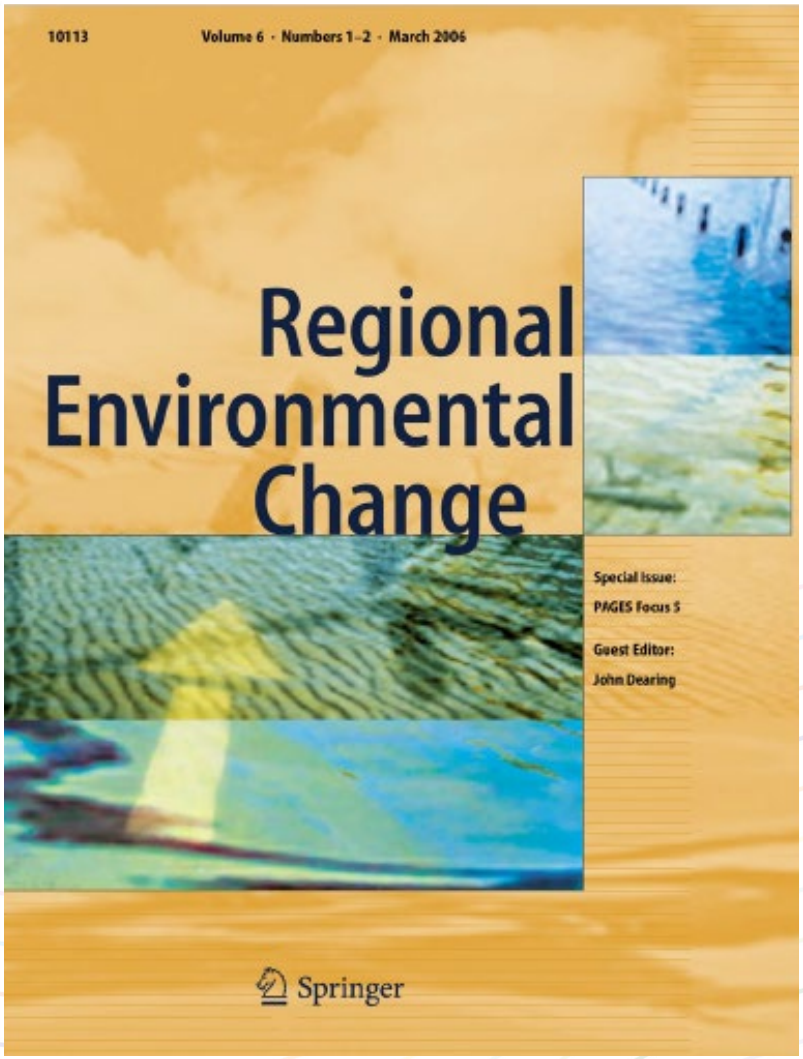
Climate Change and Agriculture



IPCC, TAR, WG1

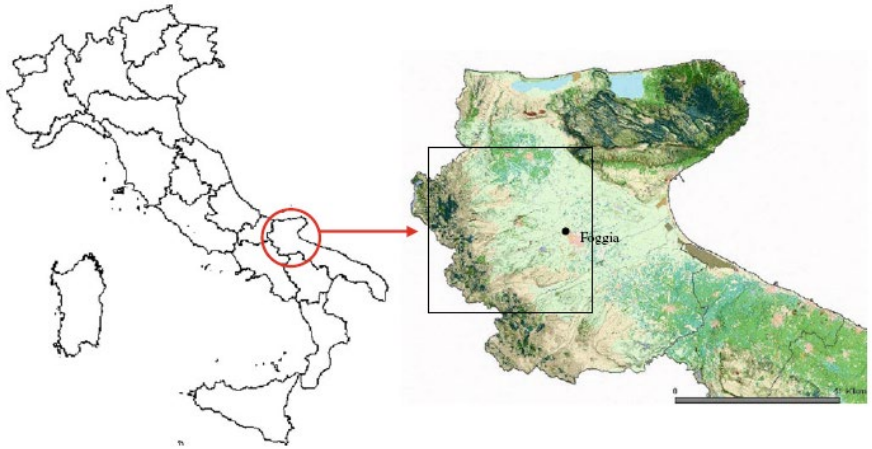
- Increase in the evapotranspiration demand of the atmosphere
- Increase in water or irrigation needs
- Reduction in the availability of water resources
- Impacts geographically uneven (above all for rainfall) and accentuated in hotspot areas

Climate change in Capitanata: the industrial tomato



Agronomic adaptation strategies under climate change for winter durum wheat and tomato in southern Italy: irrigation and nitrogen fertilization

Domenico Ventrella, Monia Charfeddine, Marco Moriondo, Michele Rinaldi & Marco Bindi



Climate change in Capitanata: the industrial tomato

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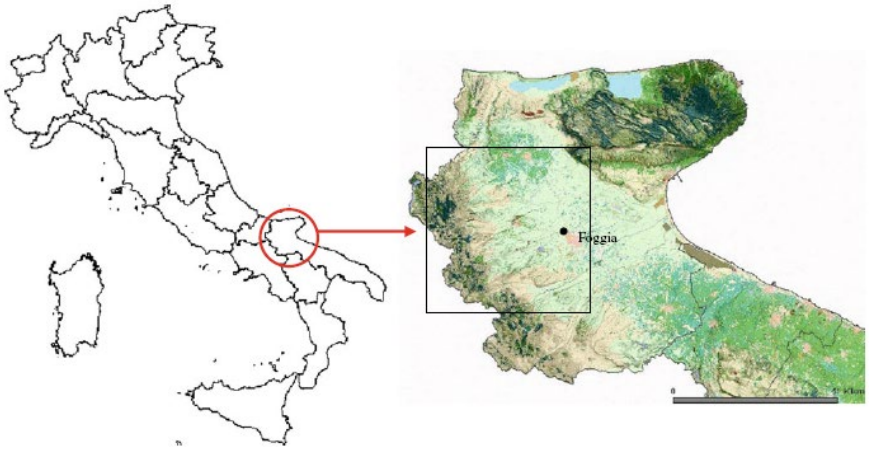
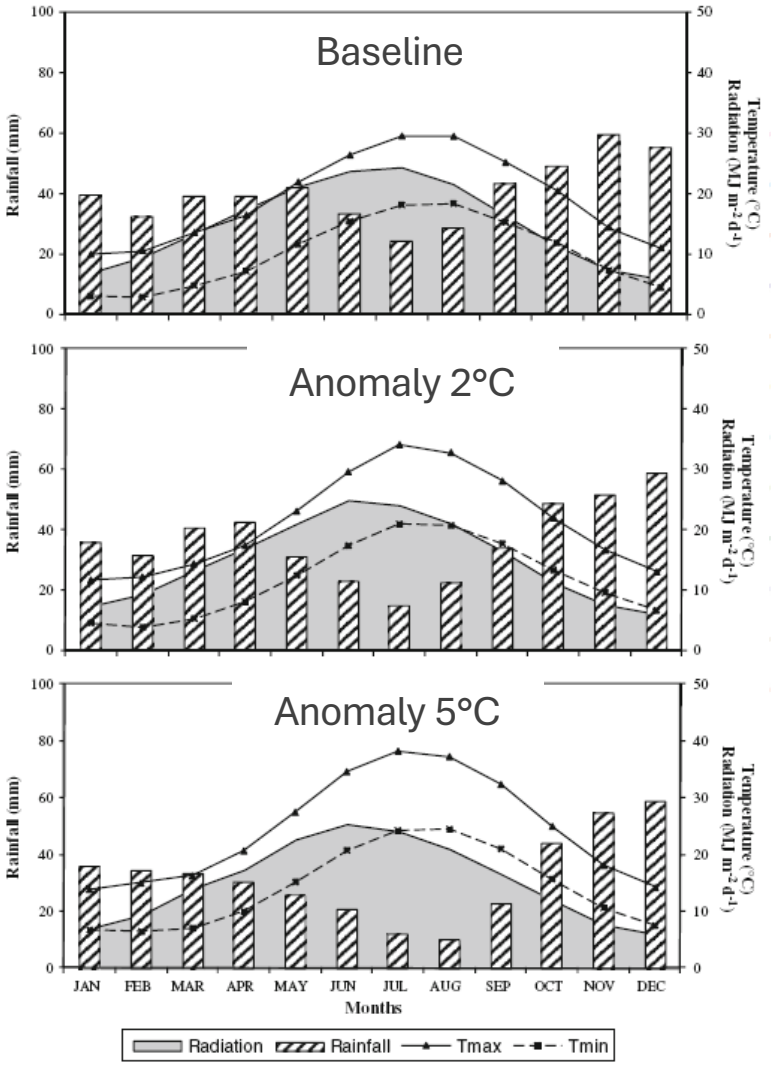
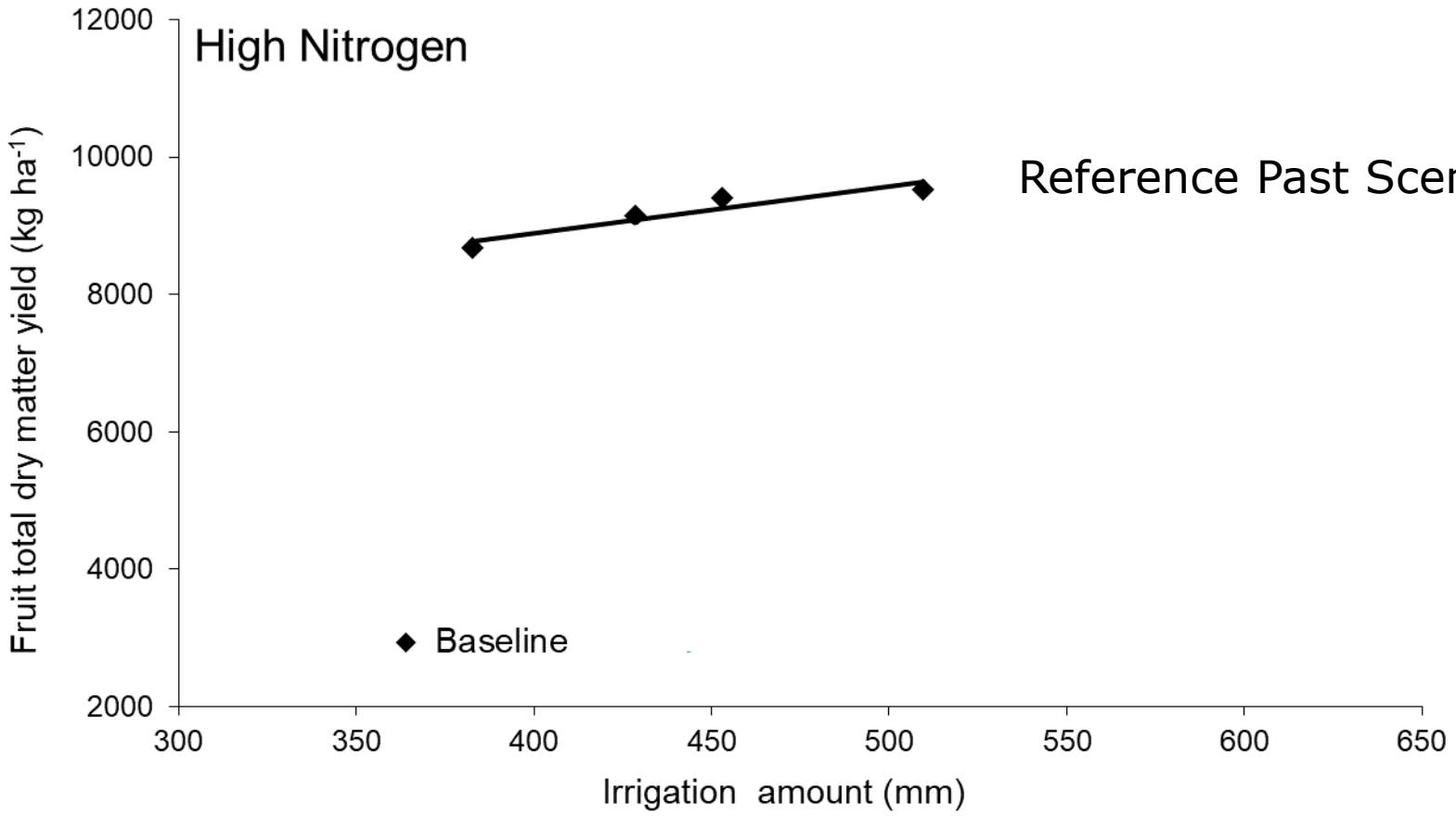
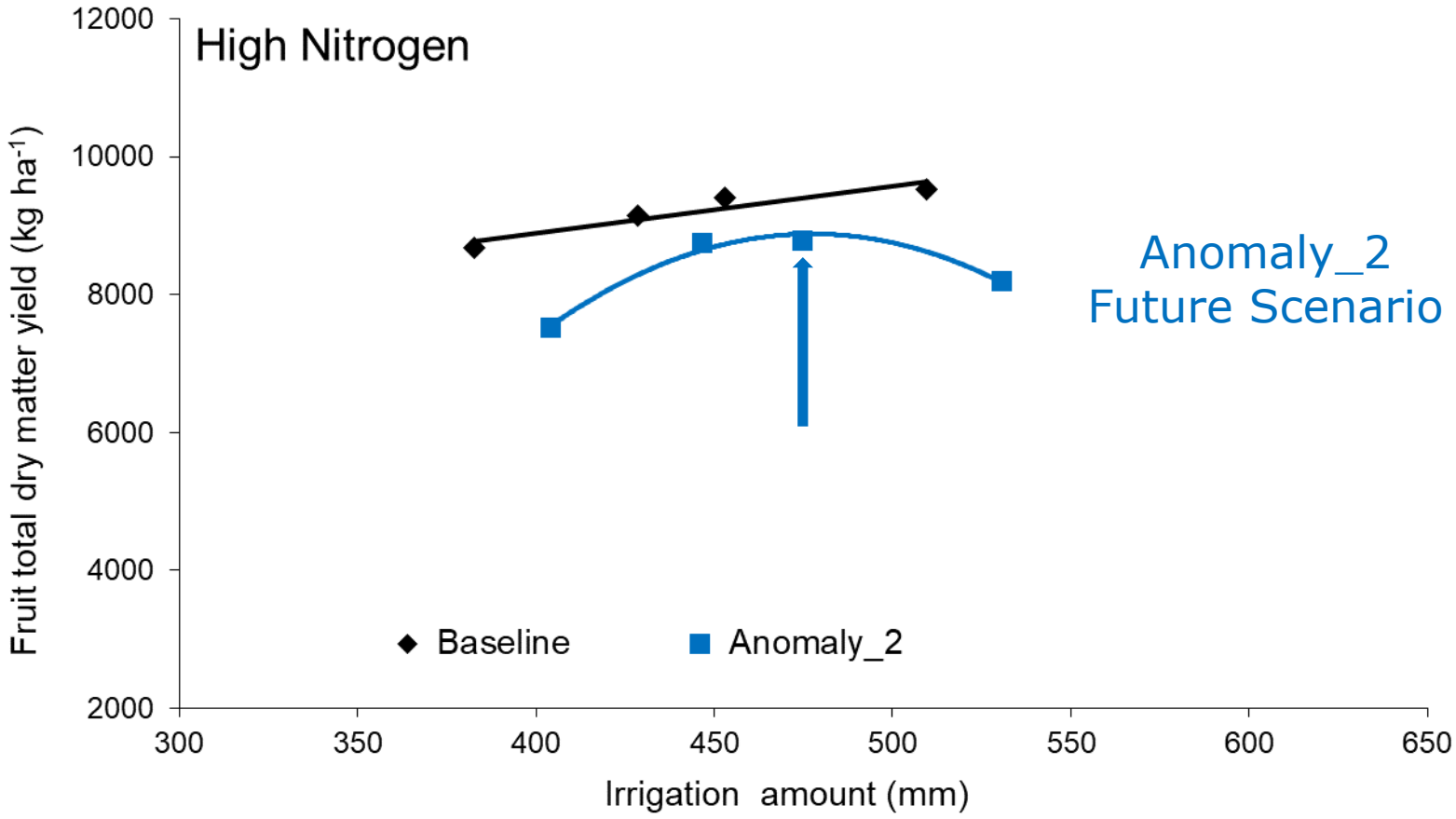




Climate change in Capitanata: response functions to irrigation



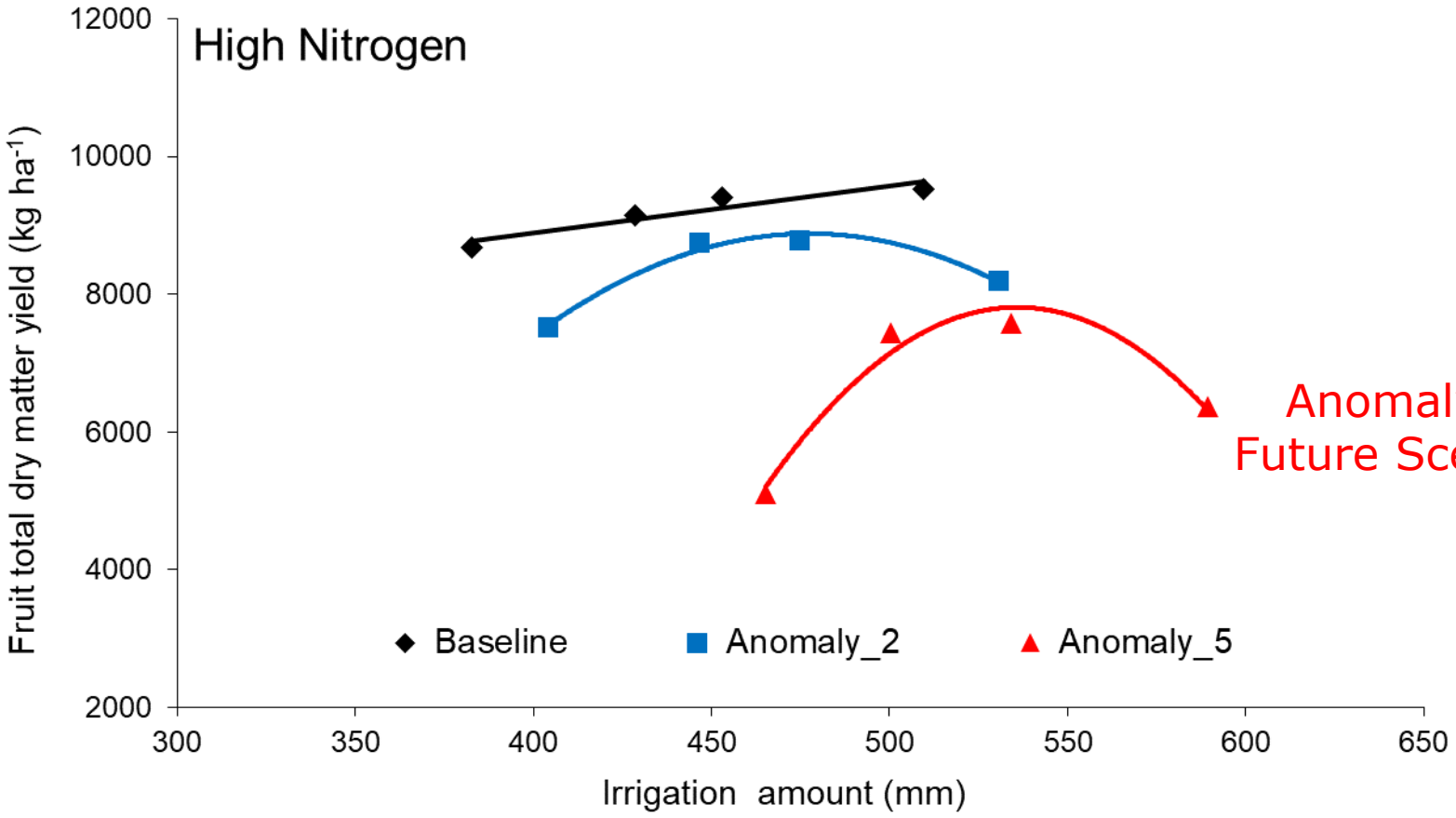
Climate change in Capitanata: response functions to irrigation



Anomaly_2
Future Scenario

+2°C: The yield gap is almost restored by optimizing irrigation

Climate change in Capitanata: response functions to irrigation



+5°C: The Adaptation Capacity is largely exceeded.
The game is lost

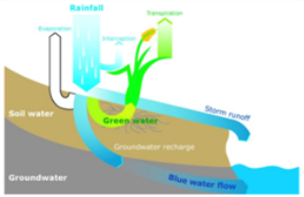
Adaptation and Mitigation

WATER 4 AGRI FOOD

Improving Mediterranean agri-food production in conditions of water scarcity

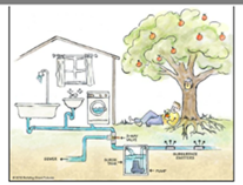
Domenico Ventrella
CREA Agricoltura e Ambiente

Green Water
Acqua piovana
che si infiltra nel suolo



Blue Water
Acqua da corpi idrici
superficiali o sotterranei

Grey Water
Acqua necessaria per assimilare il carico di inquinanti in base agli standard richiesti



Available water to meet the evapotranspiration demand of the atmosphere

The Objective

Develop knowledge and innovation to manage and supply water to the AgriFood system in less developed Italian regions, in a manner :

- ✓ compatible with the climate
- ✓ efficient
- ✓ economical
- ✓ sostainable

helping to counterbalance yield limitations due to water scarcity and mitigating impacts on the environment

Target Audience

- Farms
- Territorial water management bodies
- Companies of agricultural goods and services

Public and private partnership: Knowledge and Expertise

Canale Emiliano Romagnolo

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Agricoltura e Ambiente
Genetica e Bioinformatica
Politiche e Bioeconomia

Università di Catania
Dipartimento di Agricoltura, Alimentazione e Ambiente

Agronica
IBF

BONIFICHE FERRARESI

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irritec

planeta

polyeur
GROWING BETTER

SOCIETÀ PRODUTTORI SEMENTI S.p.A.

suez

TECNO.EL
TECNOLOGIE ELETTRONICHE

The Water4AgriFood Project

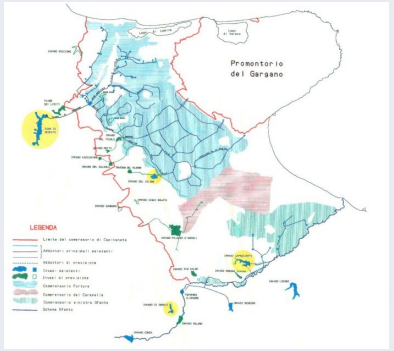
Tool-box available to farms, institutions and agro-industry to face the challenges of climate change for everything related to water

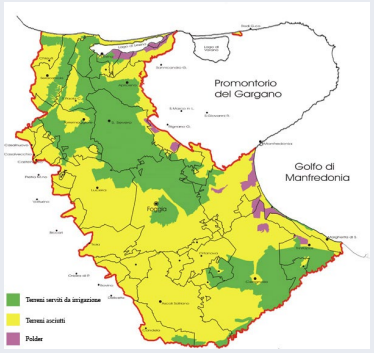
Grey Water	Use **wastewater.** Studies conducted in Sicily regarding phytoremediation, recovery of wastewater and reuse of reclaimed water. **Salvatore Barbagallo** (UniCT)	UniCT, SUEZ, Planeta
Green Water	New **arid farming**, agronomic and genetic techniques, to increase water use efficiency and soil retention capacity. Research in Sicily and Puglia, in the laboratory and in the field. **Pasquale Campi** (CREA)	CREA-AA e -GB, UniCT, Irritec, PSB, Tecno.EL
Precision Water	Irrigate with precision, reducing volumes without penalizing yield with techniques and materials, soil and vegetation management and monitoring software. Research in Puglia, Sicilia and Emilia Romagna. **Stefano Anconelli** (CER)	CER, UniCT, CREA-AA, Tecno.EL, CNIT Irritec, Polyeur, Agronica, SUEZ
Price Water	**Pricing policies** to promote the use of water that is sustainable for the environment, economy and society, guaranteeing the recovery of environmental costs. Case study in Sardegna. **Raffaella Zucaro** (CREA)	CREA-PB, Bonifiche Ferraresi
Future Water	**Adaptation** to climate change for water resource management at farm and basin level and fight against pathogens. Studies in Puglia and Sicily. **Domenico Ventrella** (CREA)	CREA-AA, UniCT

The agriculture in Capitanata

Extention of the district: 455,000 ha

Intensive agricultural activity





The most widespread crops in the Utilised Agricultural Area (UAA) of Capitanata

Crops	Hectars	% UAA	% National Yield	Irrigation requirements (m^3 ha^{-1})
Durum Wheat	200,000	40	17	
Olive	54,300	11	3	2000 - 3000
Wine vine	28,074	6	5	1800 - 3000
Tomato	13,000	3	23	4000 - 5000
Artichoke	5,600	1	15	2500 - 4000

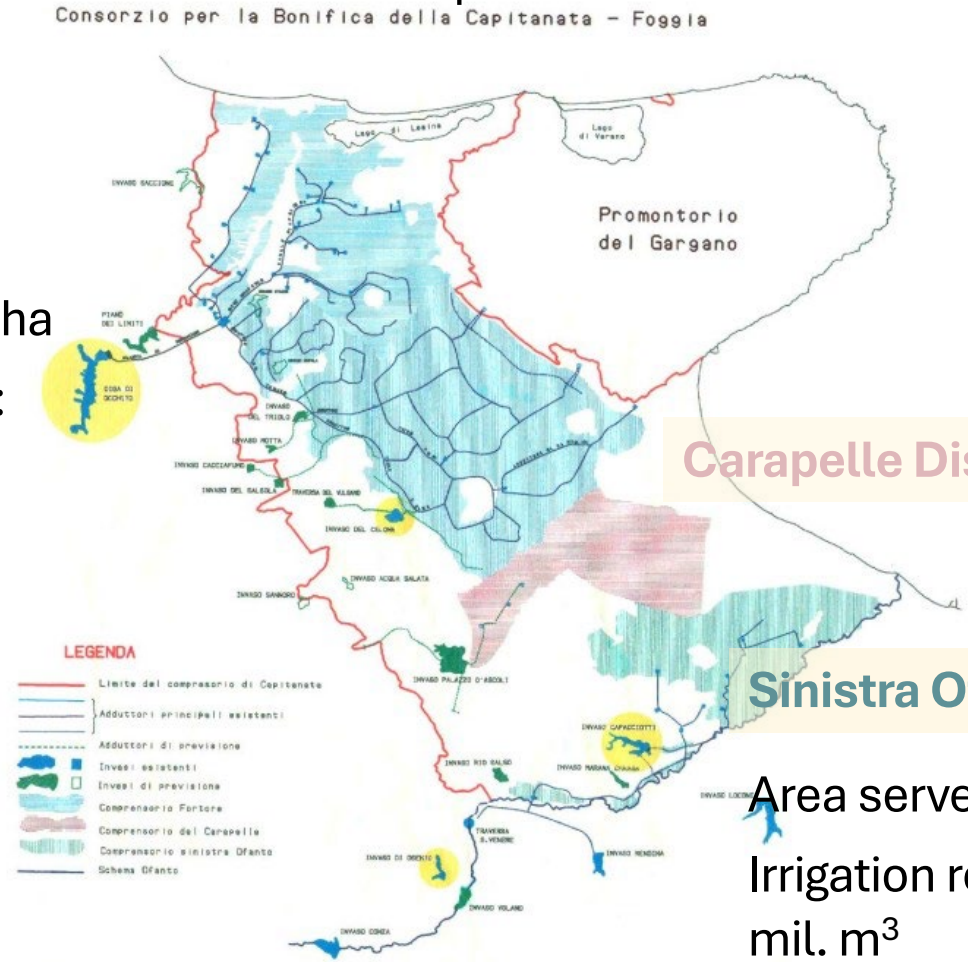
The Capitanata and the water

Consorzio per la bonifica della Capitanta
Consortium for the Reclamation of the Capitanata

Fortore District

Area served: 100.000 ha

Irrigation requirement: 200 mil. m^3



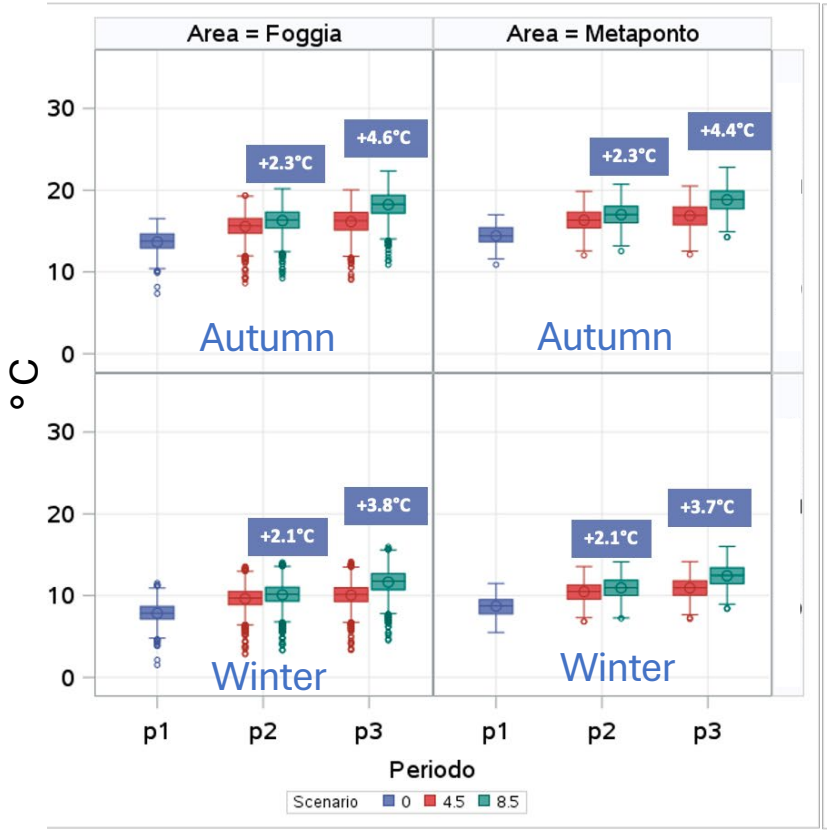
Carapelle District

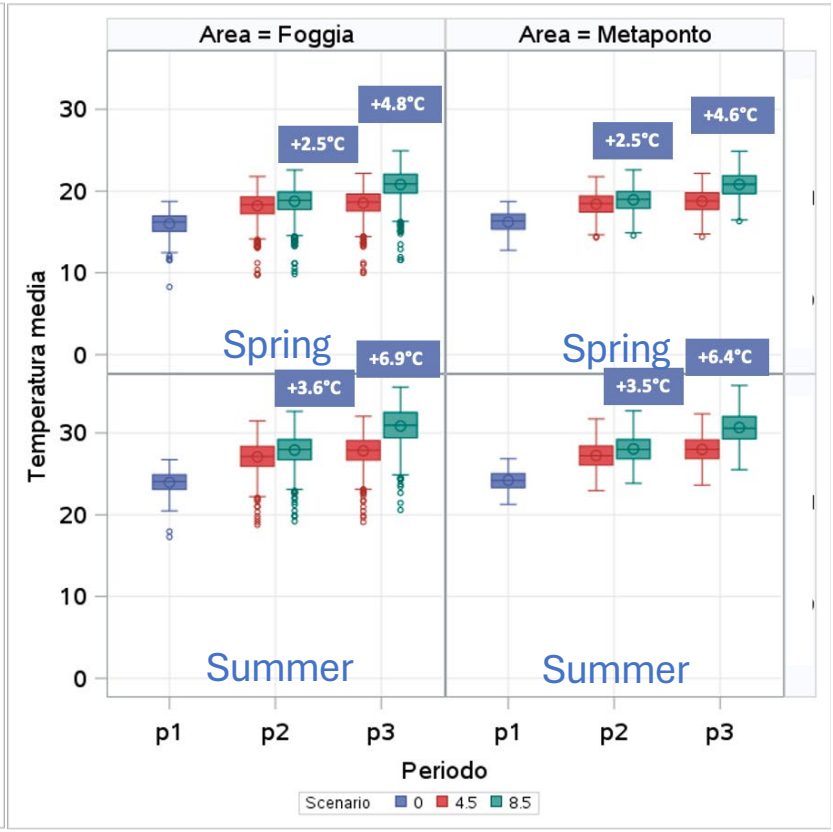
Sinistra Ofanto Disctrict

Area served : 38.000 ha

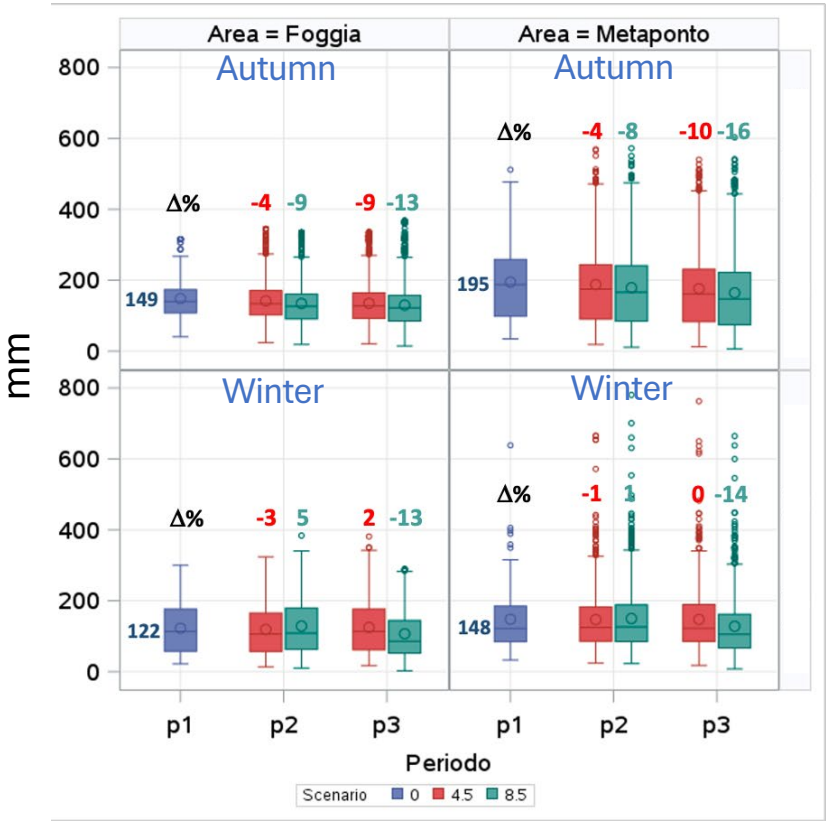
Irrigation requirement : 76 mil. m^3

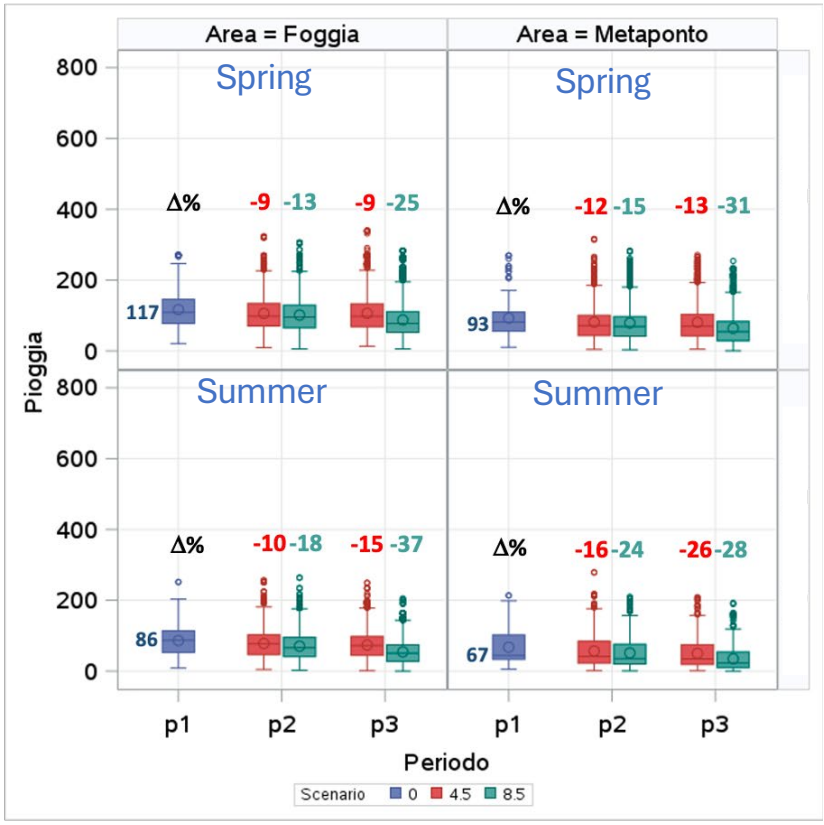
The effects of climate change: average seasonal temperature



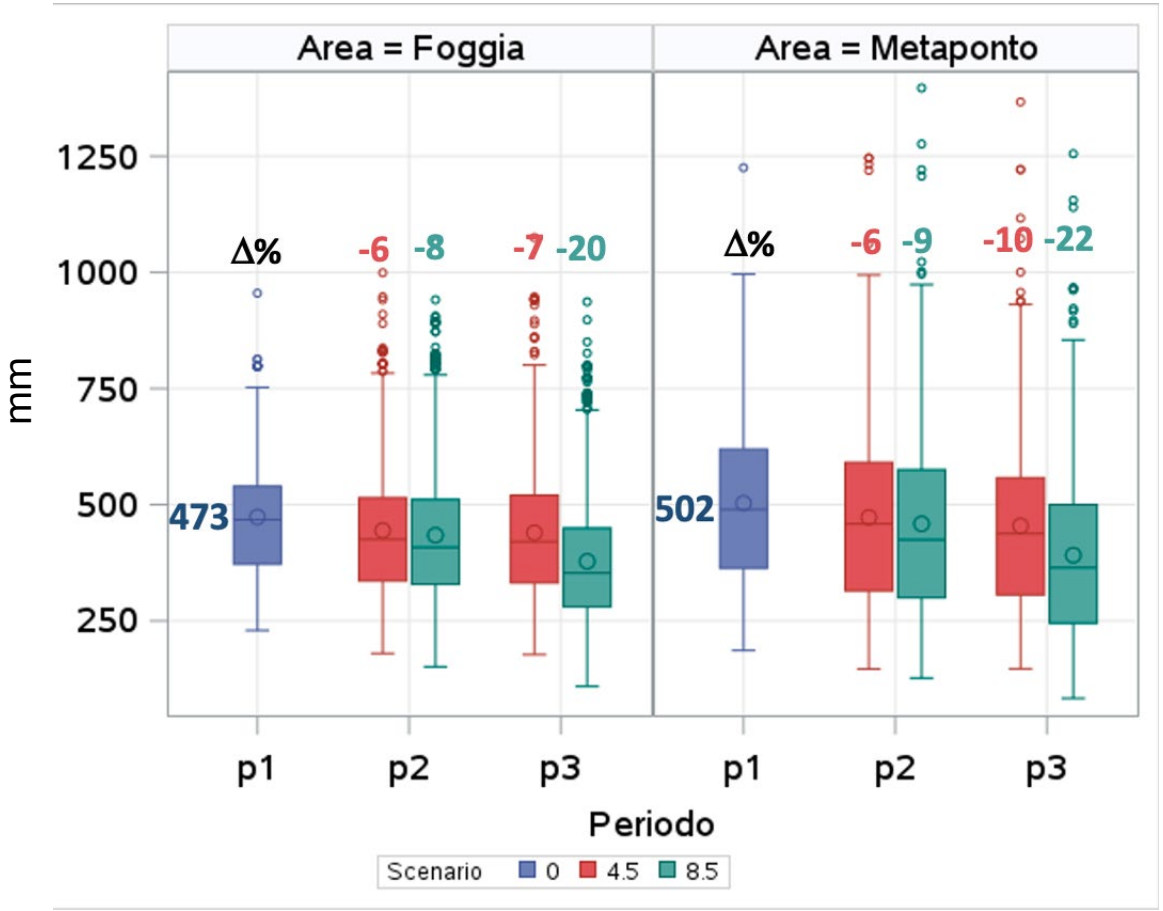


The effects of climate change: seasonal rainfall



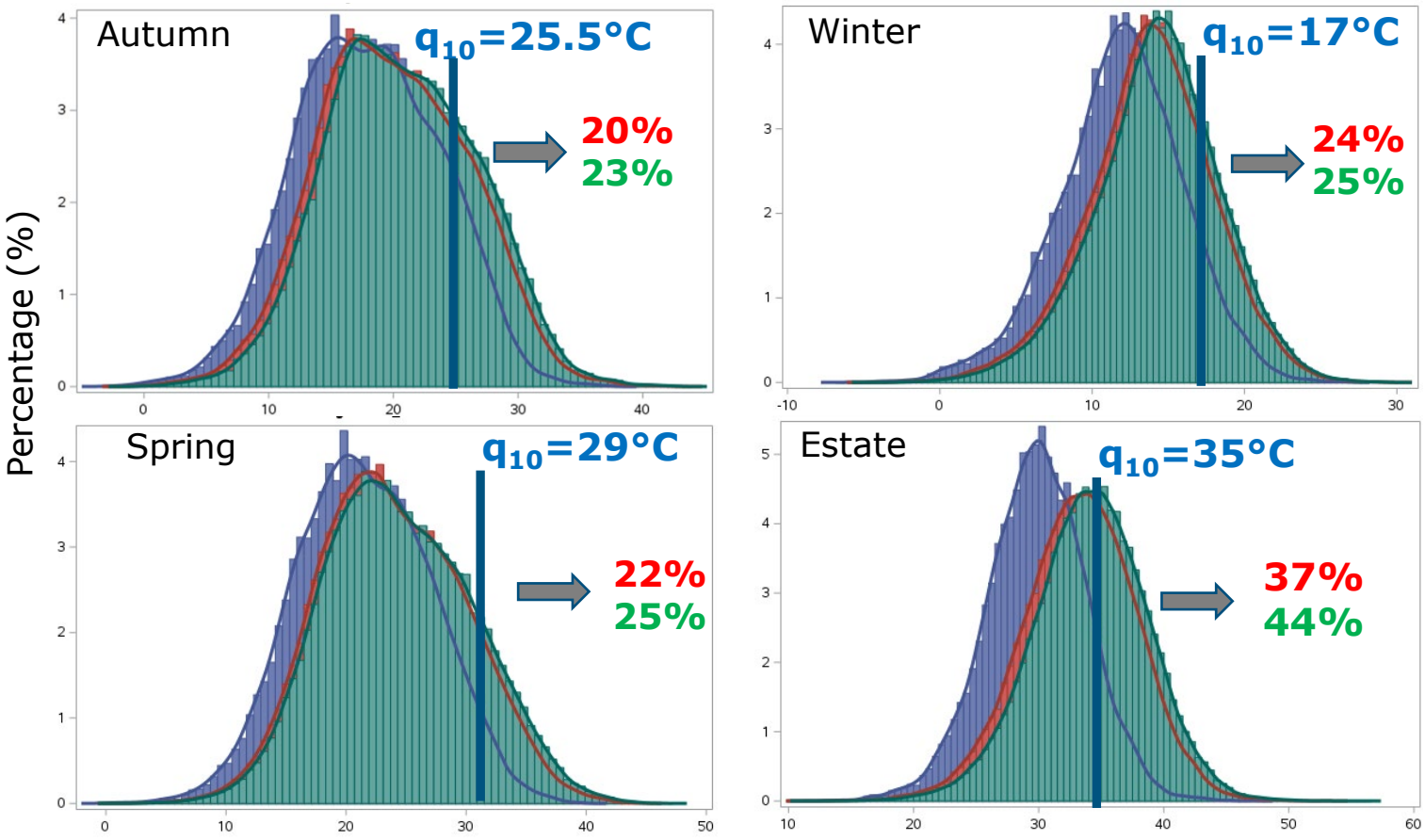


The effects of climate change: annual rainfall



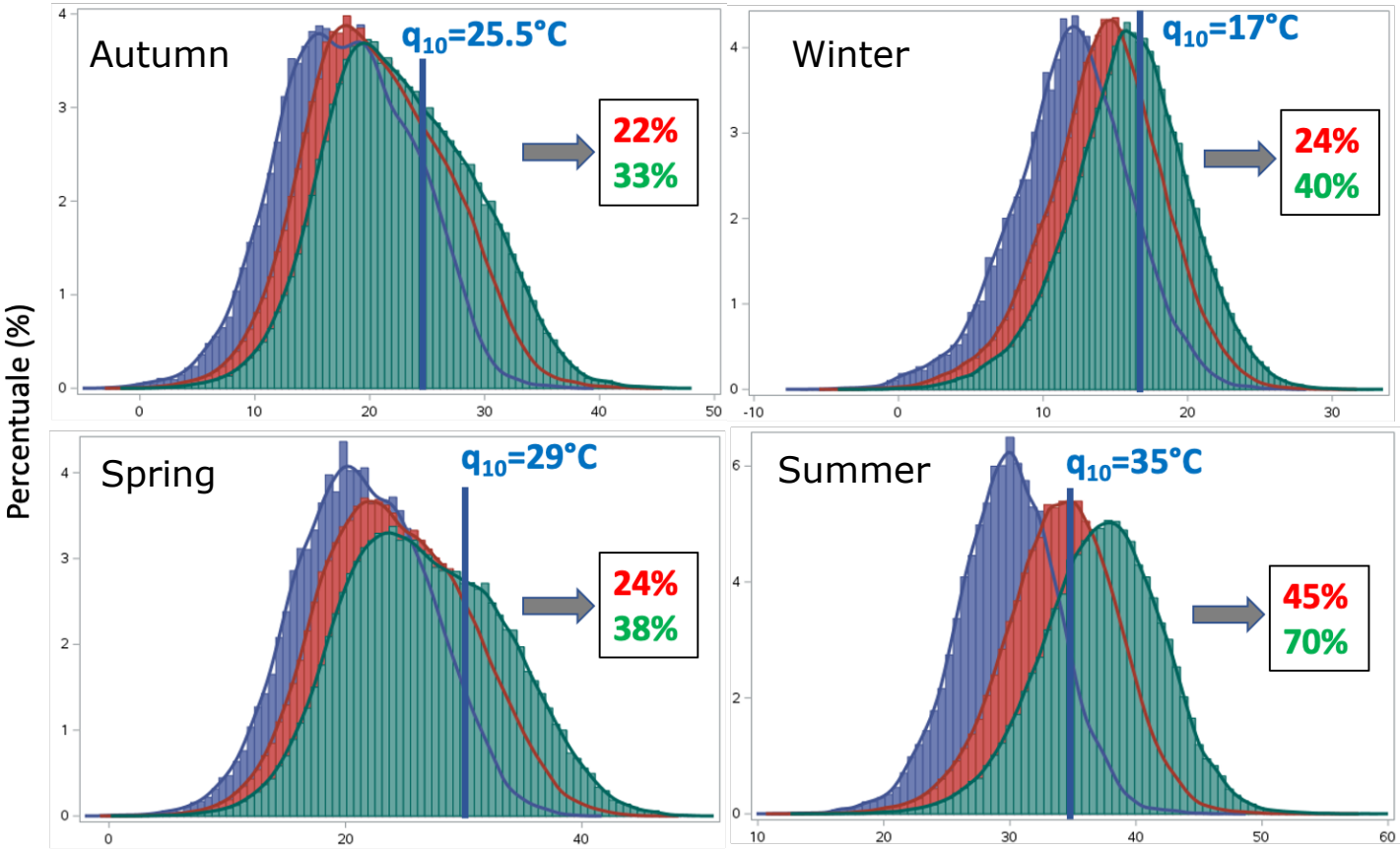
Maximum Temperature distributions in Capitanata

From 2040 to 2069,
in the **Baseline**, IPCC **RCP4.5** and IPCC **RCP8.5** scenarios

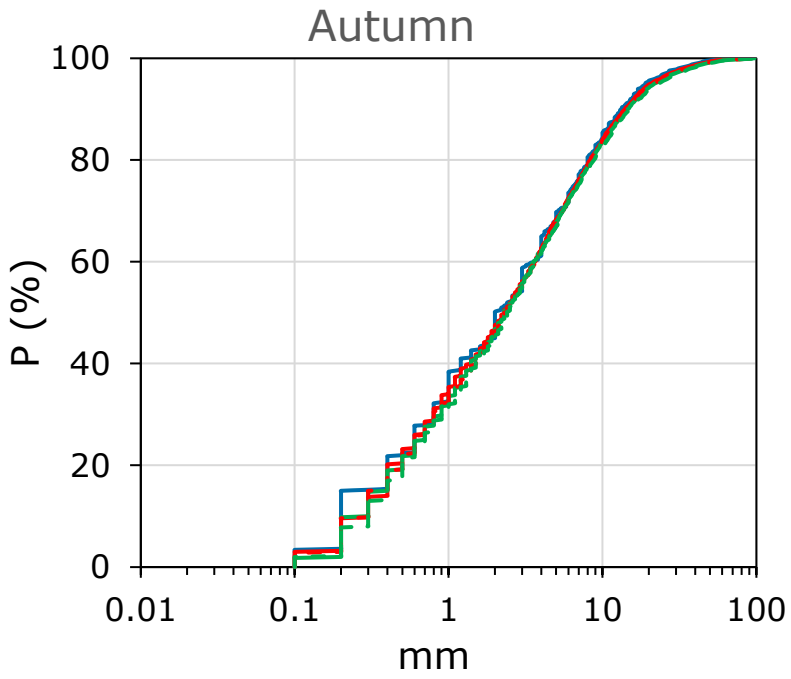


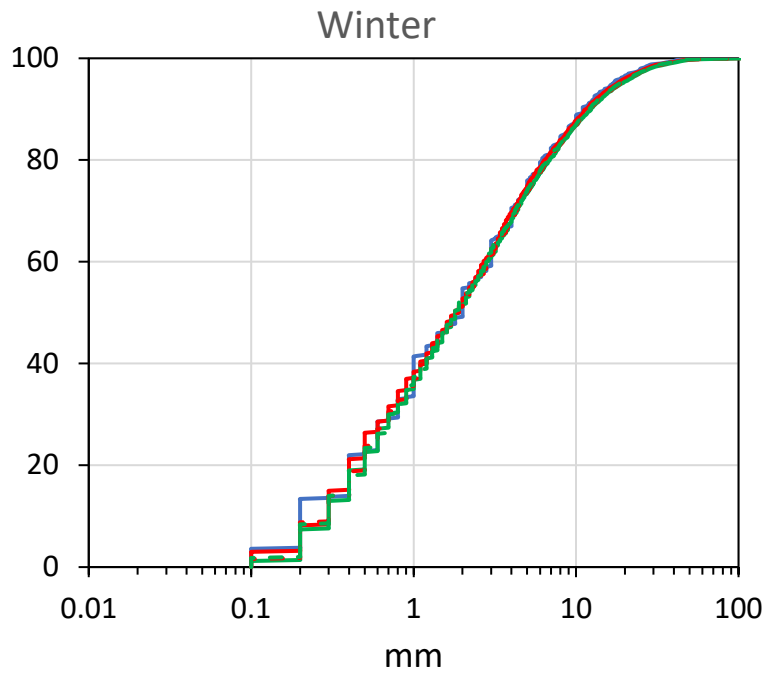
Maximum Temperature distributions in Capitanata

From 2070 to 2099,
in the **Baseline**, IPCC **RCP4.5** and IPCC **RCP8.5** scenarios



Daily rain distributions





We have a problem: the daily scale is not adequate to detect extreme events regarding rain

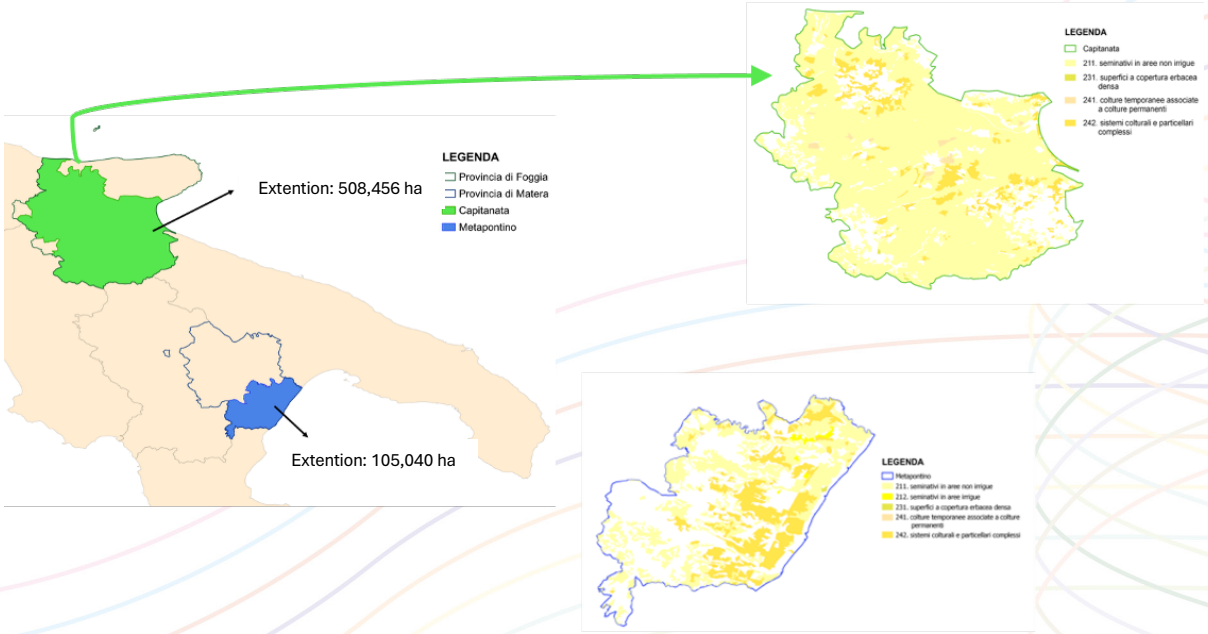
Activity 5.1. - Assessment and planning of water use following Climate Change

Development of a prototype of DSS for territorial planning according to the estimation of water consumption, in irrigation and non-irrigation, evaluating the ability of cropping systems to adapt to climate change.

Study areas: Metapontino and province of Foggia

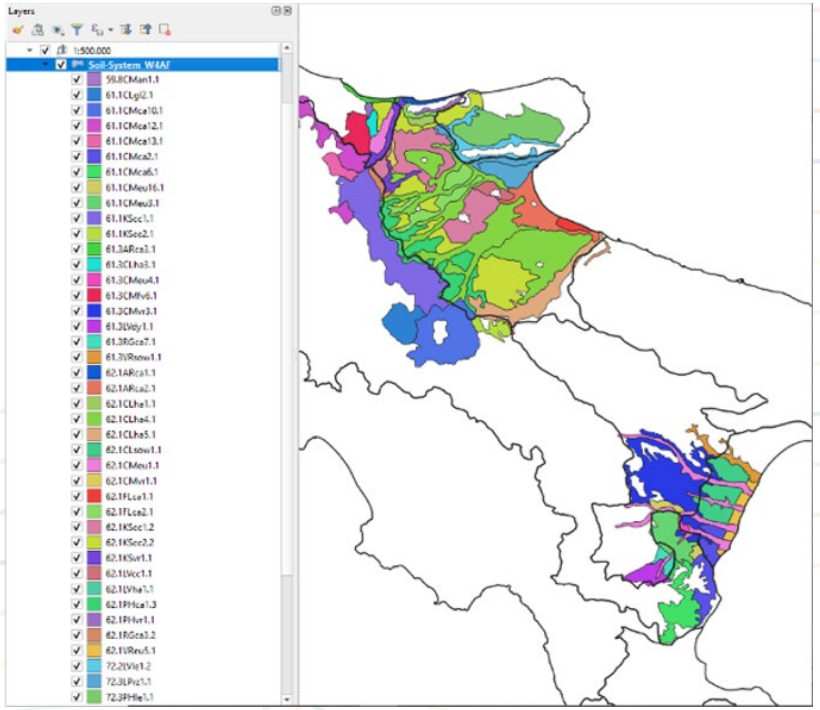
1. Land Use Information Layer

European databases of the CORINE Land Cover programme CLC, 2012



2. Soil information layer

CREA-AA database at scale 1:500000 with the identification of about 40 profiles that can be used for the determination of one-dimensional water balances by the DSS.



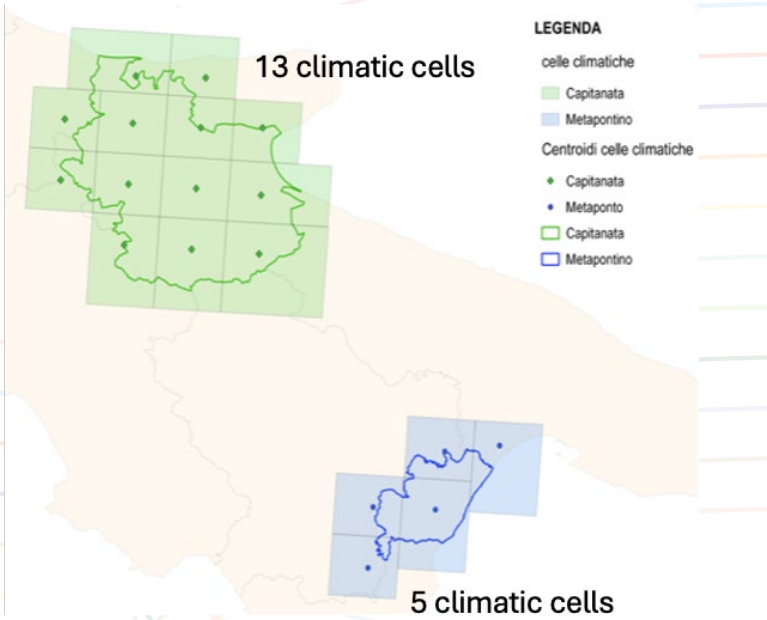
3. Climate information layer

An open-source database recently established in the Leibniz Centre for Agricultural Landscape Research (ZALF).

European grid of 25 x 25 km: 3 thirty-year periods (1980-2010, 2040-2069 and 2070-2099).

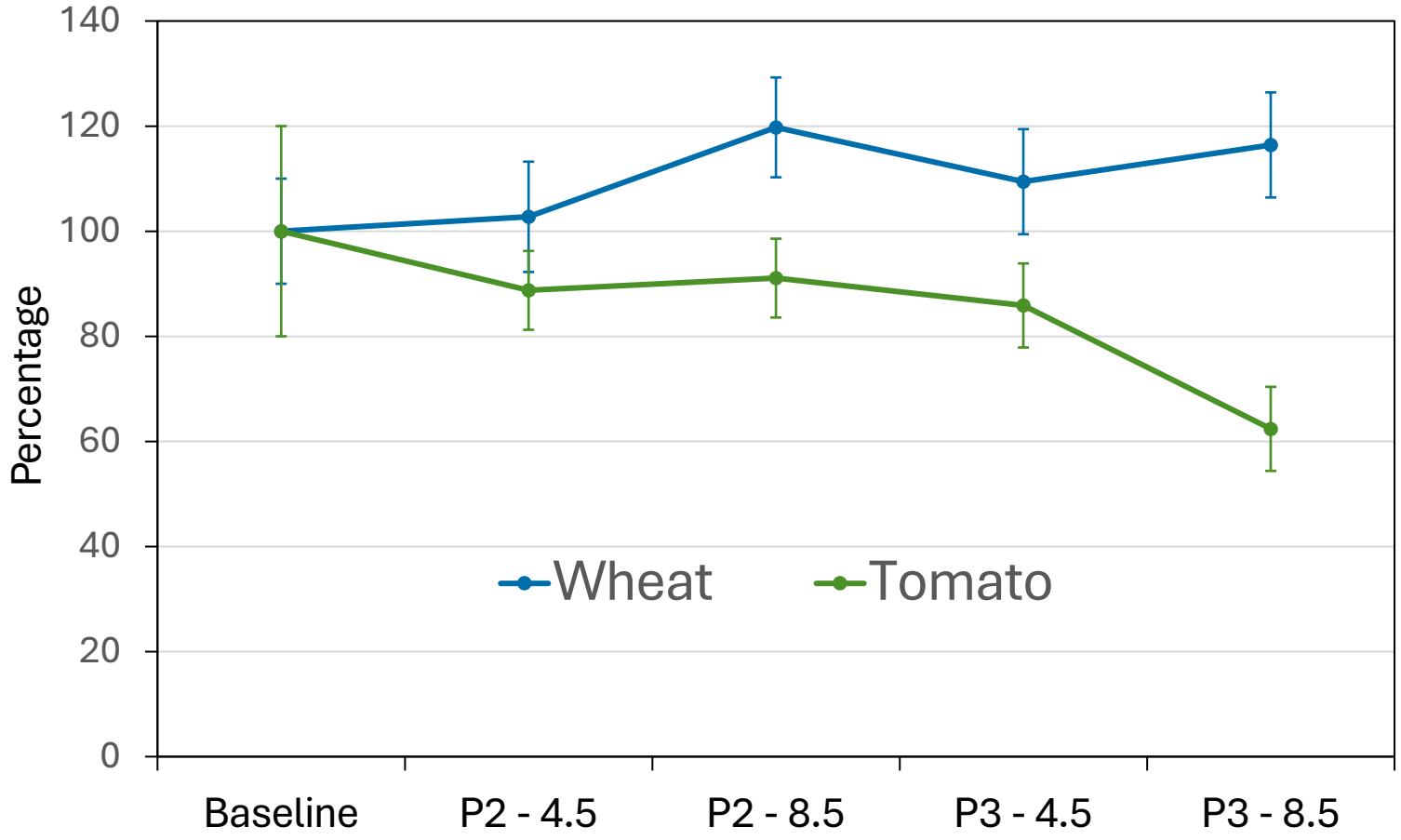
5 general climate models (GCM(GFDL-CM3, GISS-E2-R, HadGEM2-ES, MIROC5, MPI-ESM-MR).

2 IPCC forcing scenarios (RCP4.5 and RCP8.5).

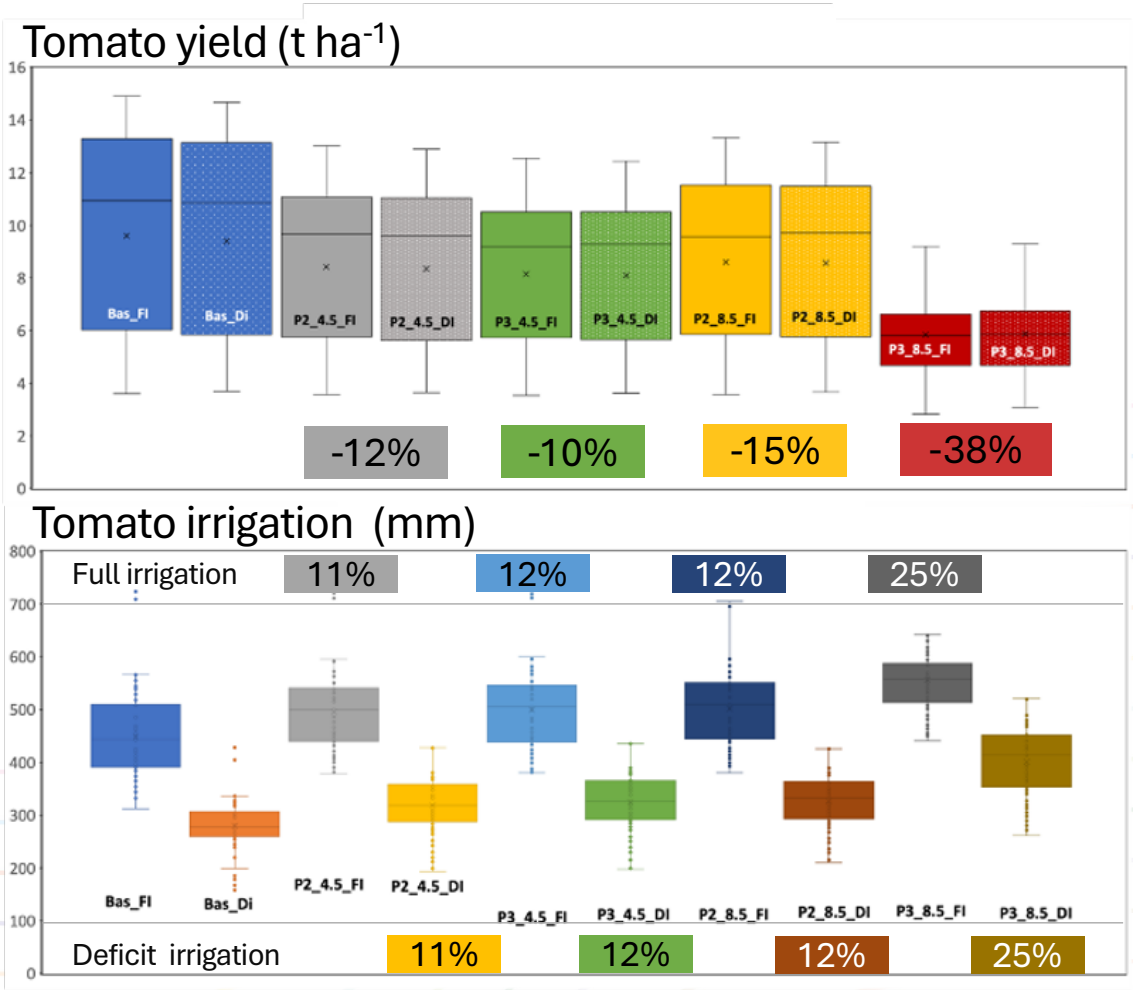


Analysis of climatic and agronomic scenario for wheat and tomato in Capitanata and Metaponto area		
Experimental factor	Durum wheat (sown on November 1st)	Tomato (transplanted on May 1st)
Irrigation	1) Rainfed; 2) 100% irrigation: max 4 irrigations during the flowering period; 3) Deficit irrigation: max 2 irrigations during the flowering period.	1) 100% Irrigation; 2) Deficit irrigation.
Simulation models: DSSAT e Aquacrop		

Effect of climate change on Wheat and Tomato yield (baseline = 100) under deficit irrigation



Impact of climate change on the yield and irrigation needs of industrial tomatoes in Capitana and subjected to full irrigation (FI) and deficit irrigation (DI).



Negative impact on yield

No difference between deficit and full irrigation

Significative increase of irrigation requirement

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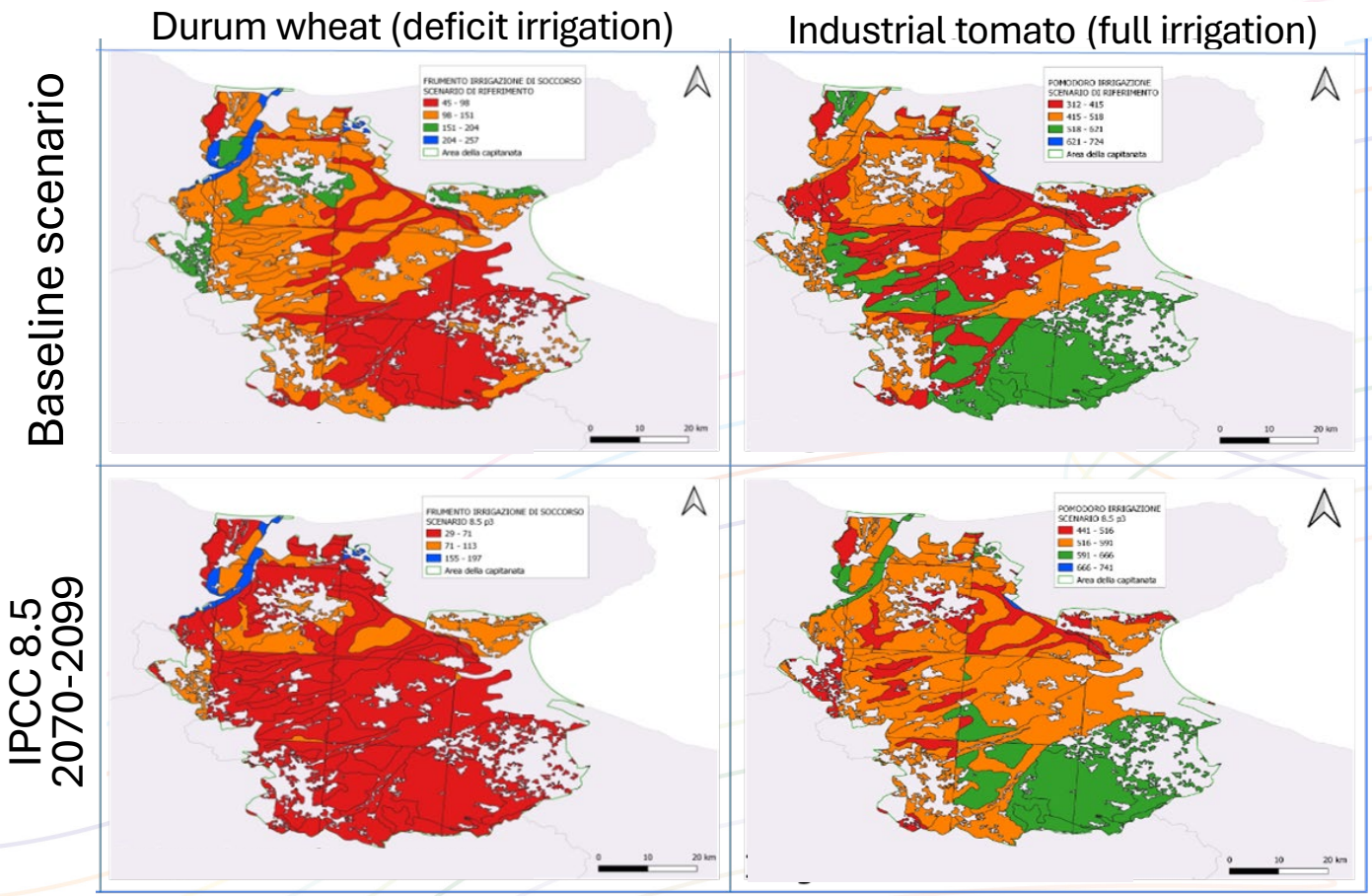
Spatial distribution of irrigation needs in Capitanats of wheat and tomatoes subjected to different irrigation regimes in a context of climate change.



Assessing the impact of climate change on irrigation water availability of the dams

To verify whether future availability will be able to meet the water requirement of irrigated crops

Tomato irrigation requirement