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Multifunctional irrigation for viticulture adaptation to climate change: a case study in northern Italy

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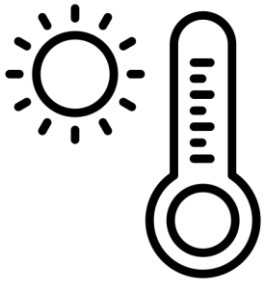
What are we dealing with?

The last decades have been characterized by an important **development of viticulture** in Italy

The increasing frequency of **extreme meteorological events** that has been observed in recent years has started raising concerns about the risks for grapevine quality and productivity, caused by summer heat waves and late spring frosts

Recent studies have shown that **evaporation of sprayed water** in the canopy layer **during heat waves** can be effective in reducing local air temperature through latent heat absorption by water evaporation



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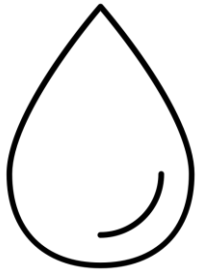

In order to minimize the temperature-related stress, **water spraying can be combined with** the control of soil water content through **drip irrigation**, to lower soil temperature and enhance turgor maintenance

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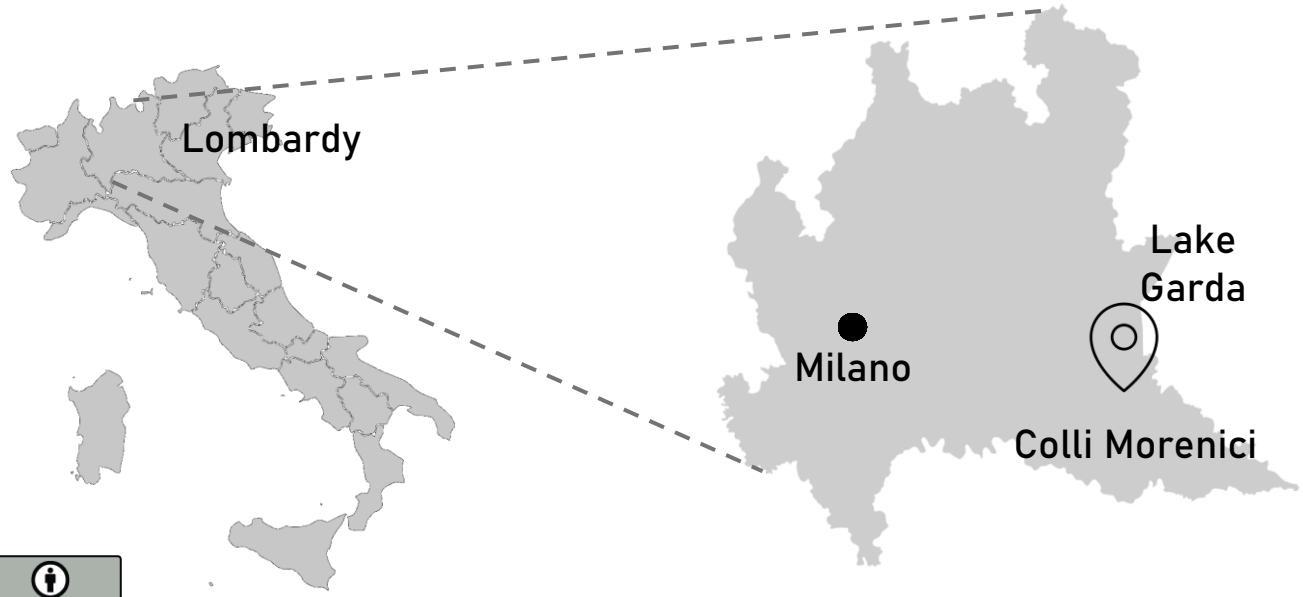
ADAM Project

The objective of **ADAM project** is to develop a **multifunctional irrigation strategy** combining controlled soil water content and protection from temperature-related stress conditions

Where?



An experimental activity has started in the 2019 season in a **Chardonnay vineyard** located in the **Colli Morenici area** (Lombardy, Italy)

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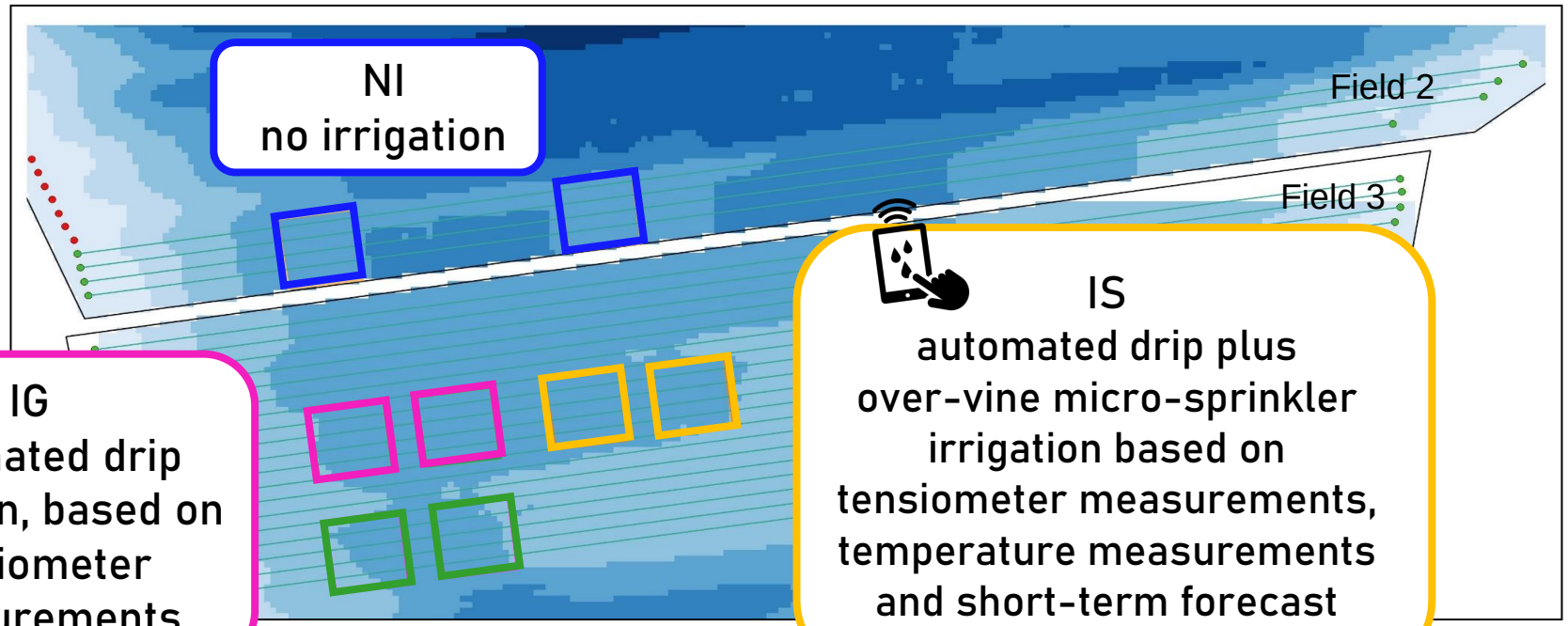
Irrigation Management Strategies

Four irrigation management strategies are adopted in 8 different plots of the experimental field



Irrigation is activated before heat wave occurrence, based on 5 days-ahead, 3-hourly, temperature and rainfall forecasts

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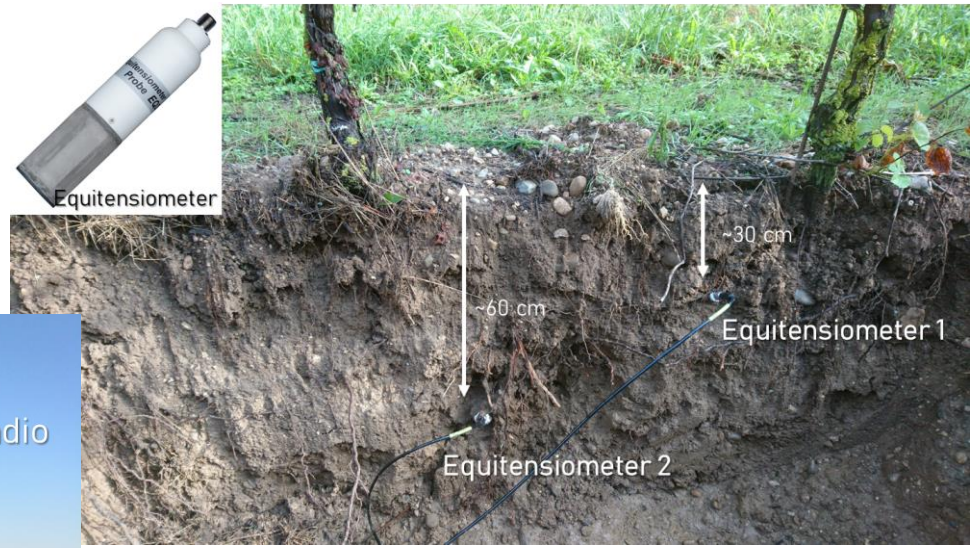
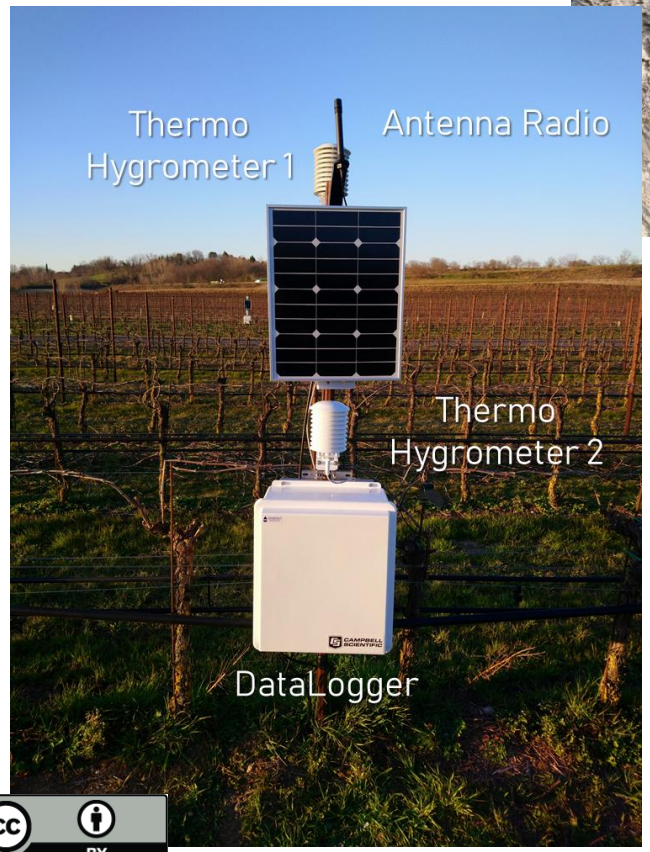
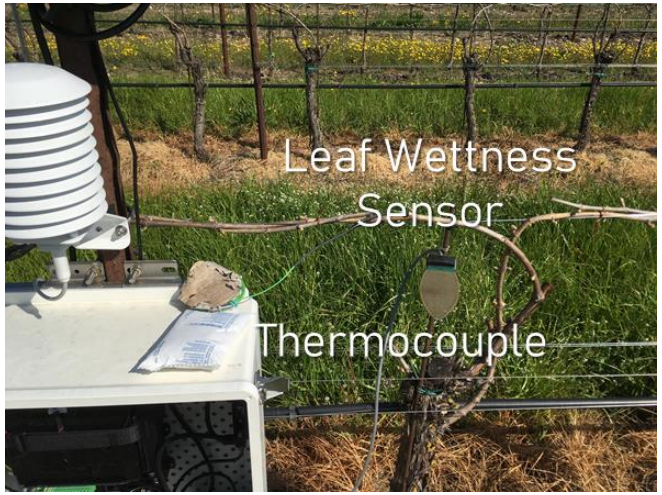
Agro-Meteorological Monitoring System

Soil Sensors

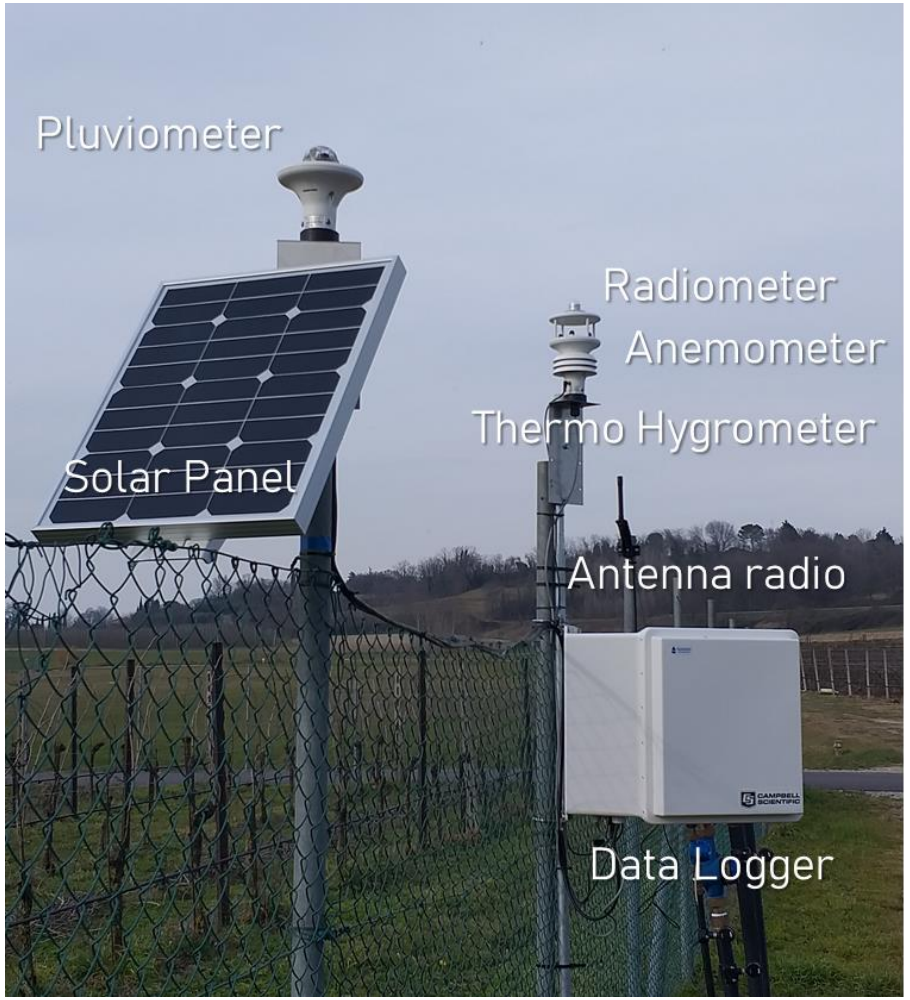


Plant Sensors





Agro-Meteorological Station



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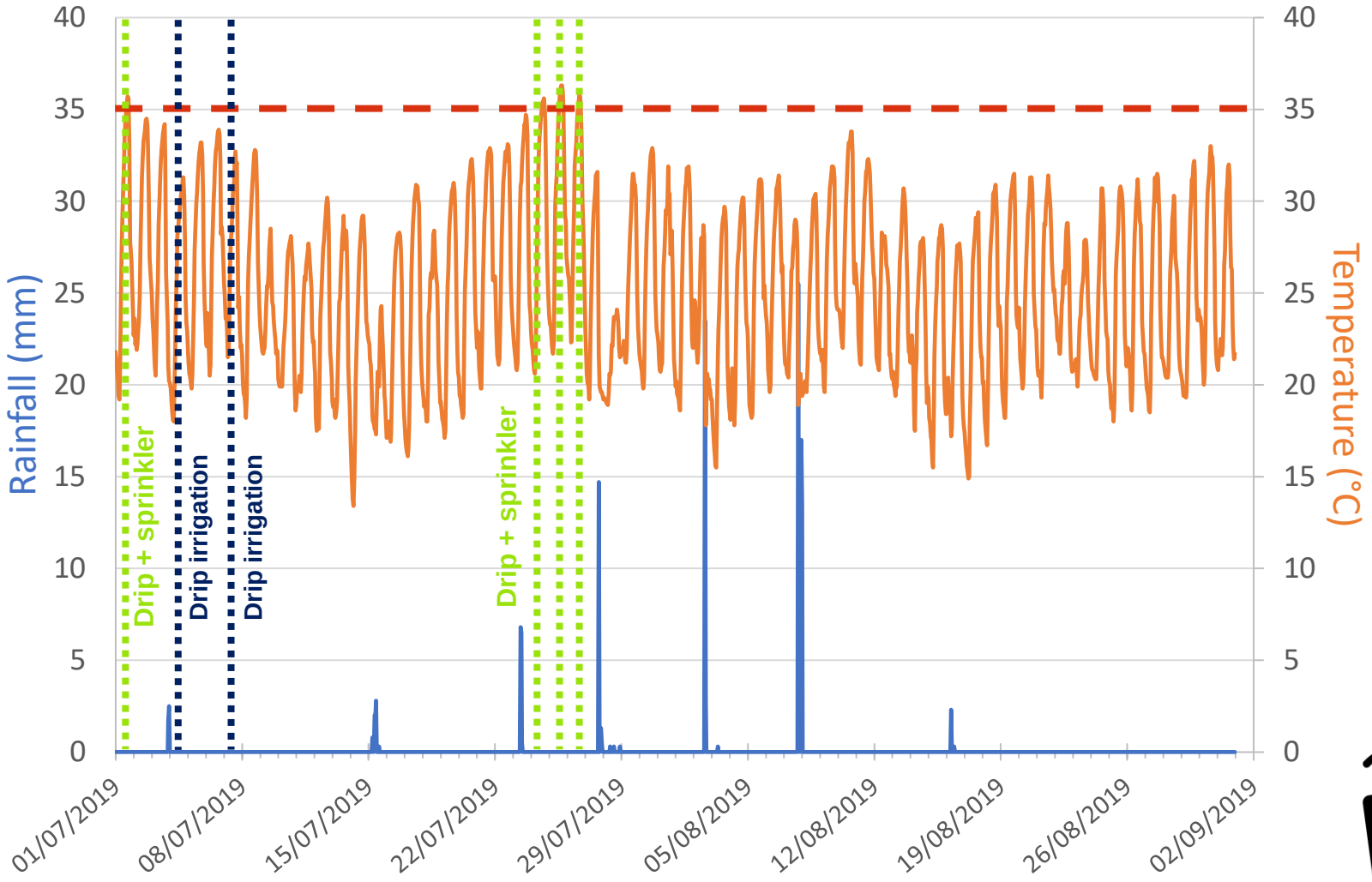
Season 2019 – When to irrigate?



6 water applications were activated during Summer 2019 in the IS sector *(vertical dashed lines)*

4 of them with over-vine micro-sprinkler in IS sectors, when temperature exceeded 35°C *(green vertical dashed lines)*

40 mm of water used for drip irrigation and 100 mm for micro-sprinkler irrigation, during the whole season

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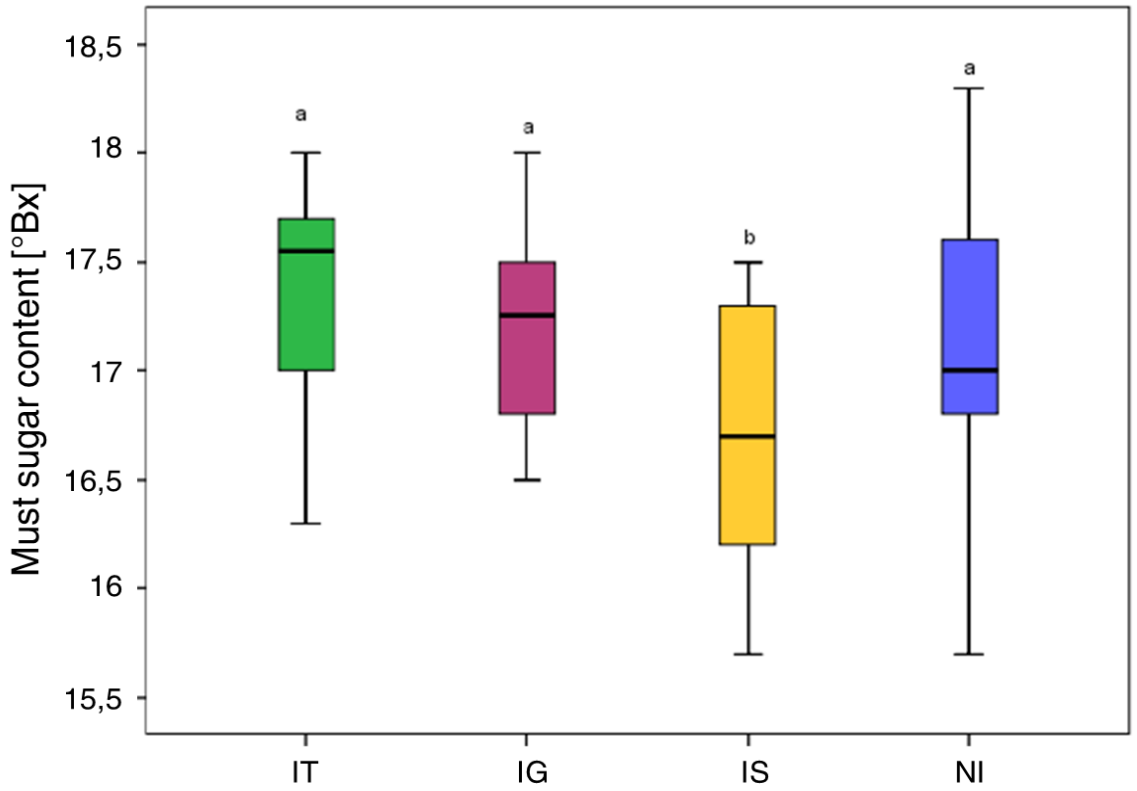
Season 2019 – Preliminary Results

With IS irrigation strategy

- Lower must sugar content
- Higher acidity
- Lower carotenoids content
- Delayed berry grapes ripening
- Lower polyphenol content at harvest



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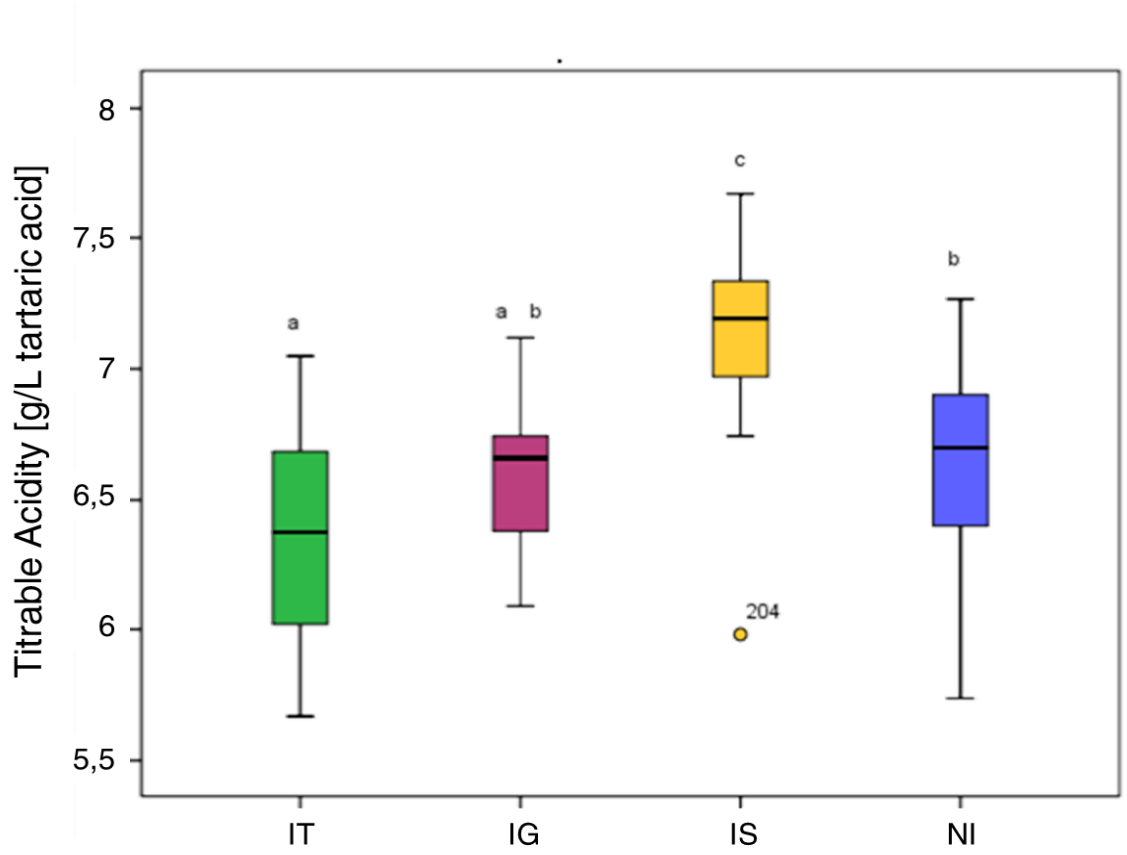

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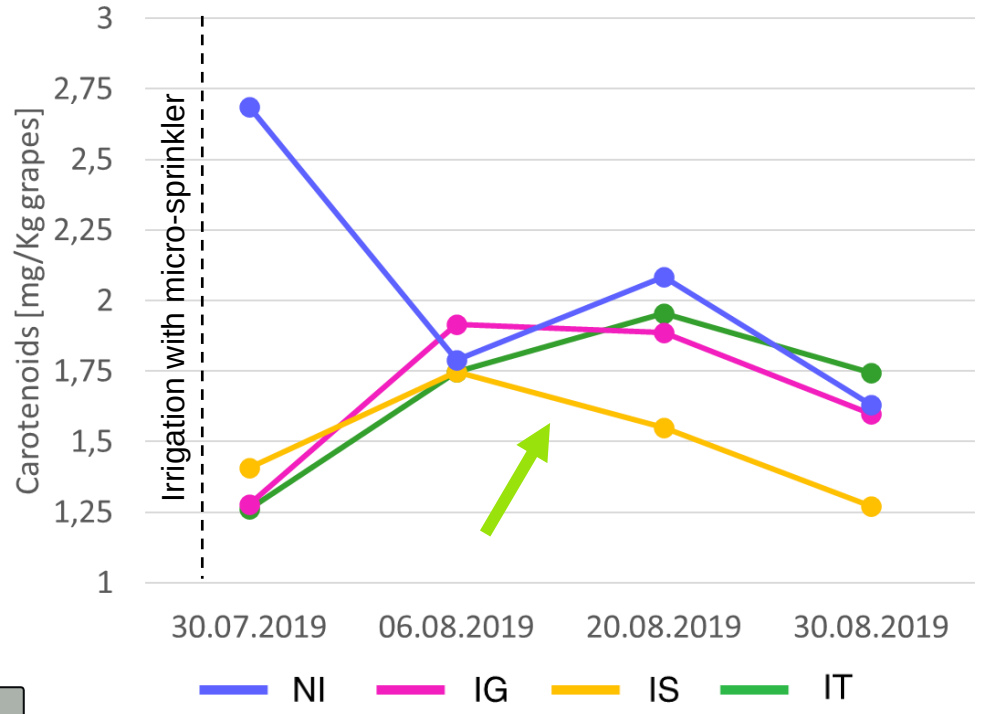
» *The presence of carotenoids is an indicator of grapevine stress conditions*



Overall we have obtained improved grape characteristics for high range white wine production

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Season 2020 & 2021 – Future Goals

- Define a preliminary protocol for multi-functional irrigation management
- Assess the irrigation water requirements and the energy consumptions
- Test the effectiveness of VIS/NIR techniques for the quick measurement of crop conditions
- Verify the sustainability of the different irrigation management strategies, both at the farm and district scale

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