



**Large Scale Irrigation Management Tools for Sustainable
Water Management in Rural Areas and Protection of
Receiving Aquatic Ecosystems**

<https://www.interregir2ma.eu/>

Irrigation of Young Olive Trees with Treated Waste Water

Fotia Konstantina

IR2MA Final Workshop
24/6/2021

WEB event | Organisation: University of
Ioannina, Greece

Water reuse EU



- Needs
 - Water scarcity
 - Limited water resources
 - Limited good quality water resources
- Status water reuse for agricultural irrigation EU
 - 1.7 billion m³ /year
- Legal basis
 - 91/271/EEC European Wastewater Directive
 - 2000/60/EC Water Framework Directive
 - 2008/105/EC on Environmental Quality Standards
 - **2020/741/EC on Minimum Quality Requirements for Treated Waste Water Reuse (in force in 2023)**

Water reuse potential EU



New EC Directive

- could lead to a substantial increase of water reuse in agricultural irrigation up to 6.6 billion m³ /year in EU countries
- less strict microbial standards in terms of E. coli
- no provisions for the maximum permissible concentrations of
 - selected heavy metals and metalloids
 - certain agronomic characteristics of the reclaimed water for agricultural irrigation

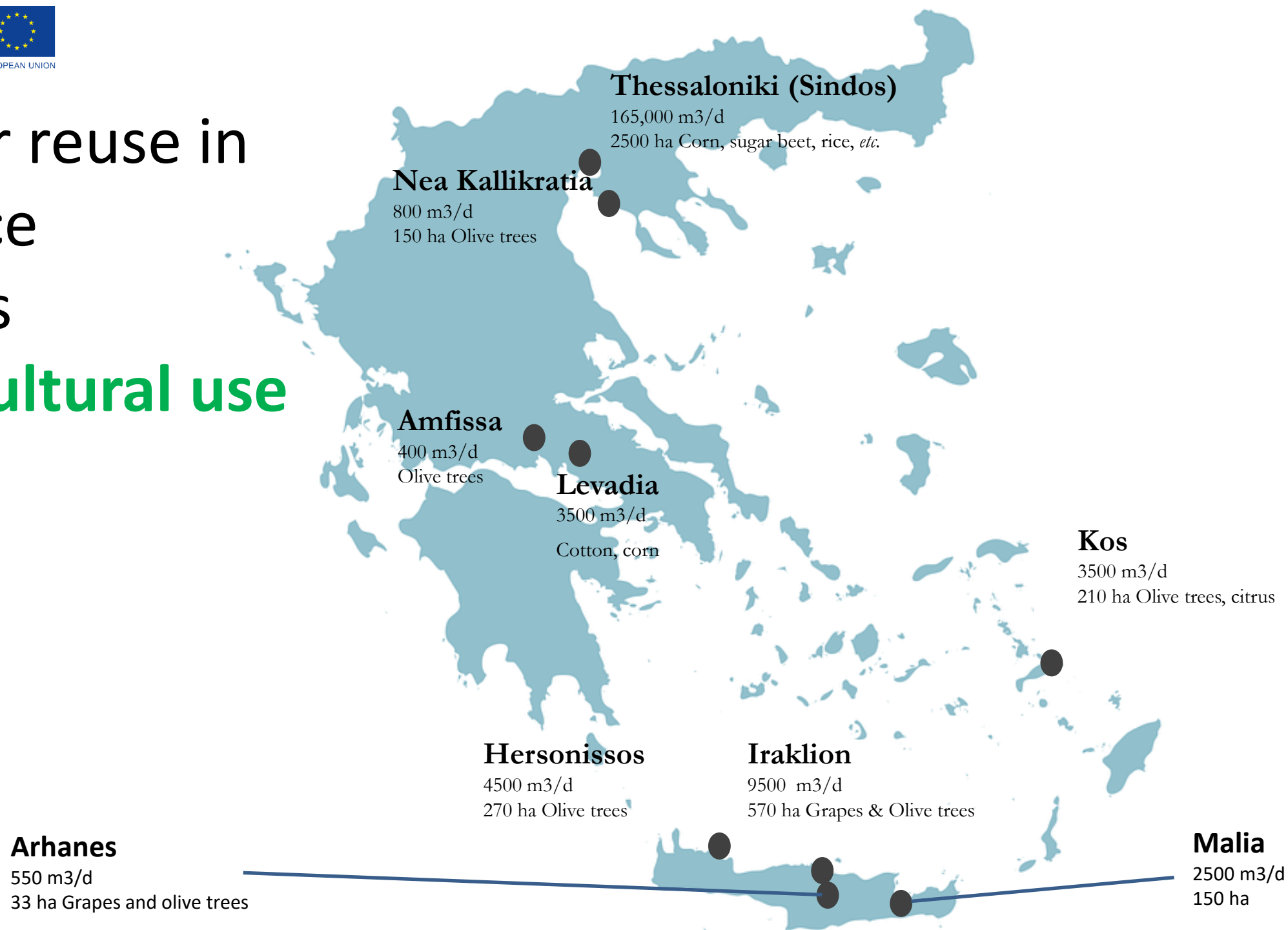
Water reuse in Greece

Need



- Typical Mediterranean climate
- Spatial not uniformity of rain
 - 300 to 500 mm in southeastern Greece - 800 to 1200 mm in the northwestern parts
- Temporal not uniformity of rain
 - Wet winters dry summers (need for irrigation)
- Periodical droughts every almost 8 years
- expected to have an 18% precipitation decrease by midcentury, and 22% by the end of the century
- The EU Joint Research Center Report 2018
 - In Greece in 2050 > 20% pressure on water resources compared to 2010

Water reuse in Greece Status Agricultural use

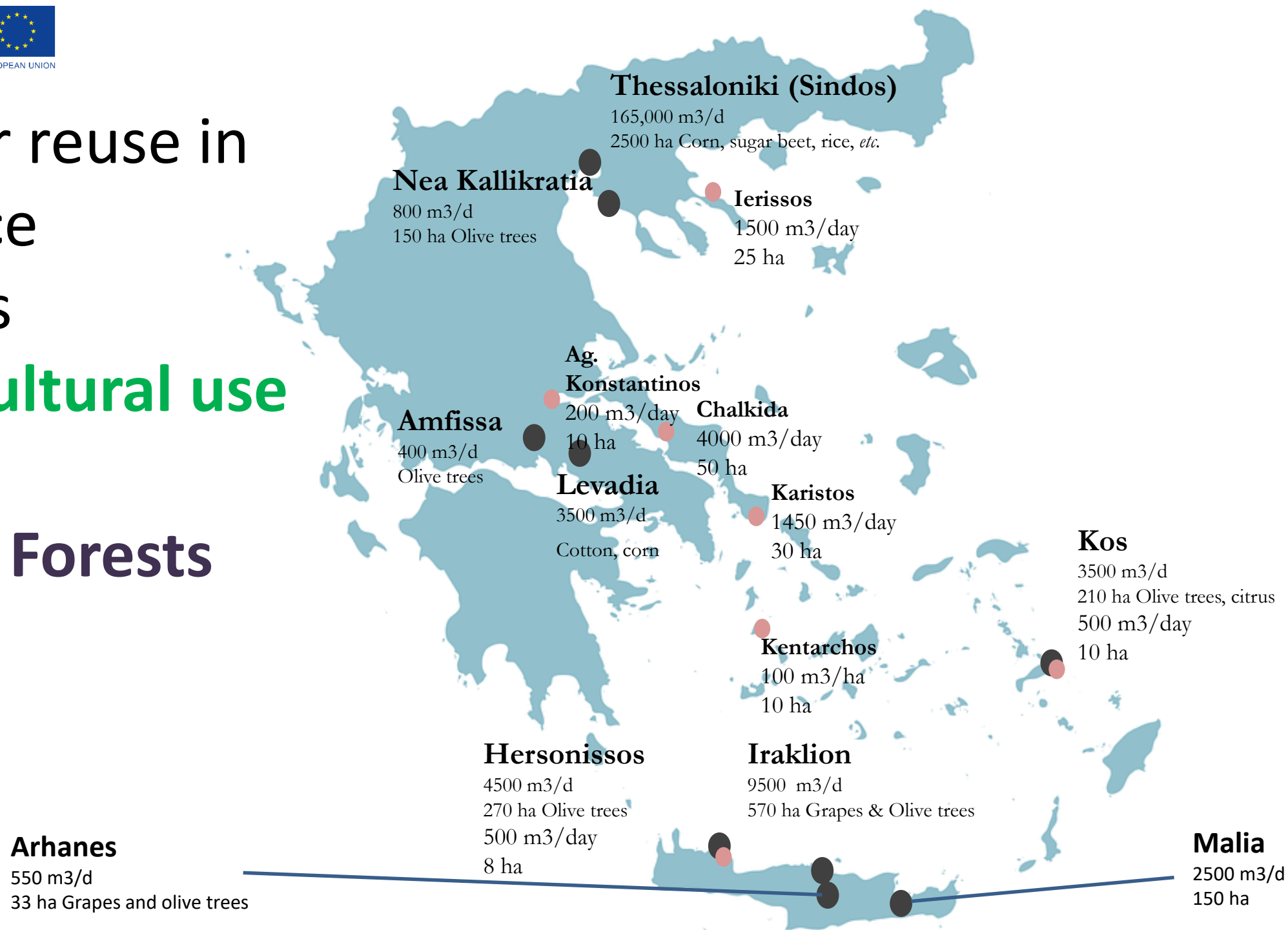


Water reuse in Greece

Status

Agricultural use

+ Parks Forests



Water reuse in Greece

Status

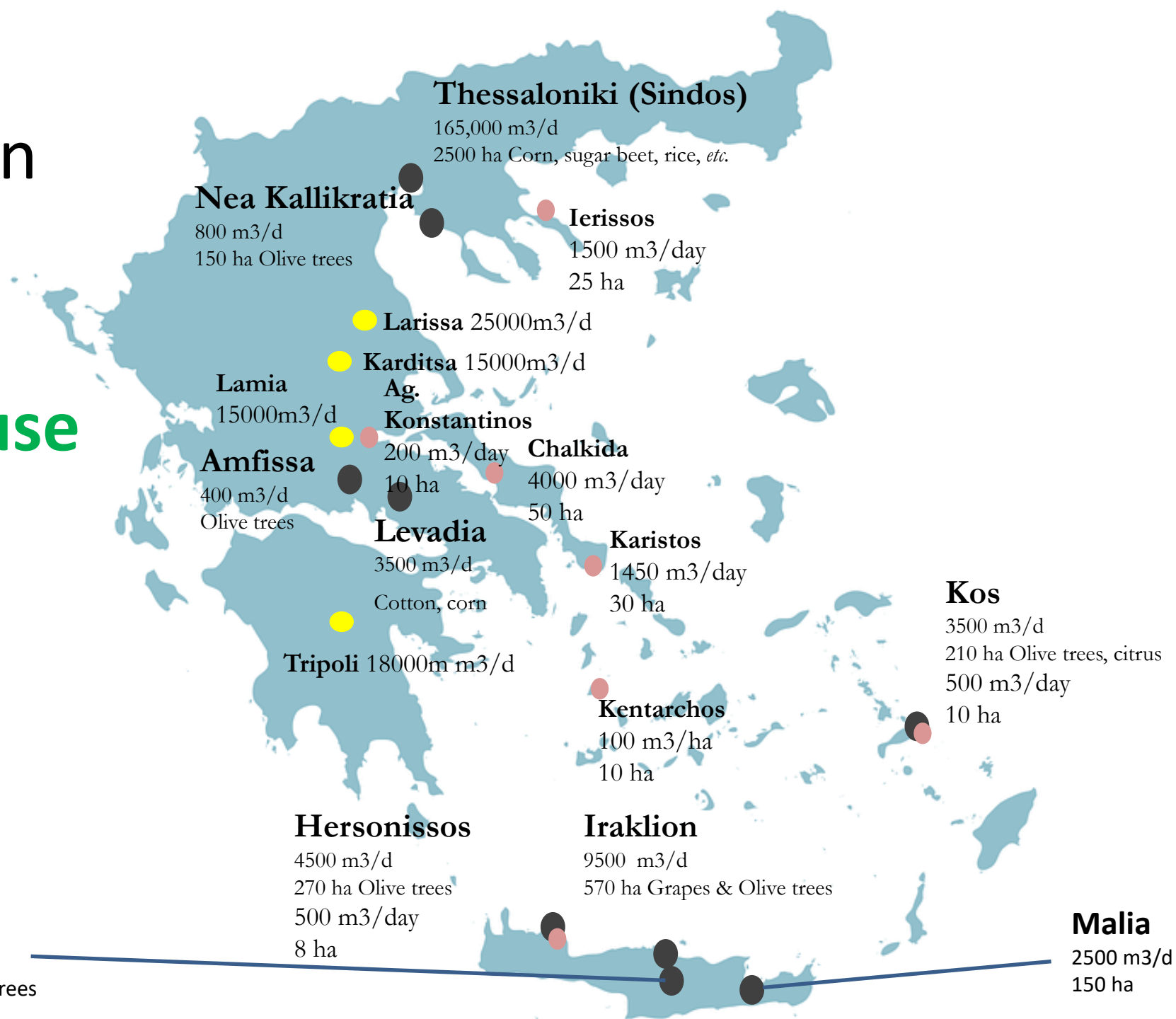
Agricultural use

+

Parks Forests

+

Indirect Use



Water reuse in Greece

Legal framework



- J.M.D.145116/2011 Determination of terms and procedures for the reuse of treated wastewater. Govern. Gazette B'354/8-3-2011
- J.M.D.191002/2013 Amendment of J.M.D. 145116/2011 “Determination of terms and procedures for the reuse of treated wastewater”. Govern. Gazette B'2220/9-9-2013
- J.M.D. 127402/2016 on the reuse of olive mills waste Govern. Gazette B' 3924/7-12-2016

Water reuse in Greece

Potential

- restricted
- Athens's WWTP 35% of the country's population, located in the small island of Psitalia
- transport 20,000 m³/day of treated effluent from the island back to the city areas for landscape irrigation and industrial use
- estimated cost 0.40€/m³
- not cost effective



Major draw backs

- Investments in infrastructure
- Strict quality standards according to local legal framework
- Not public acceptance (especially for edible plants)
- Farmers reluctance



New EC Directive is expected to raise the potential for water reuse

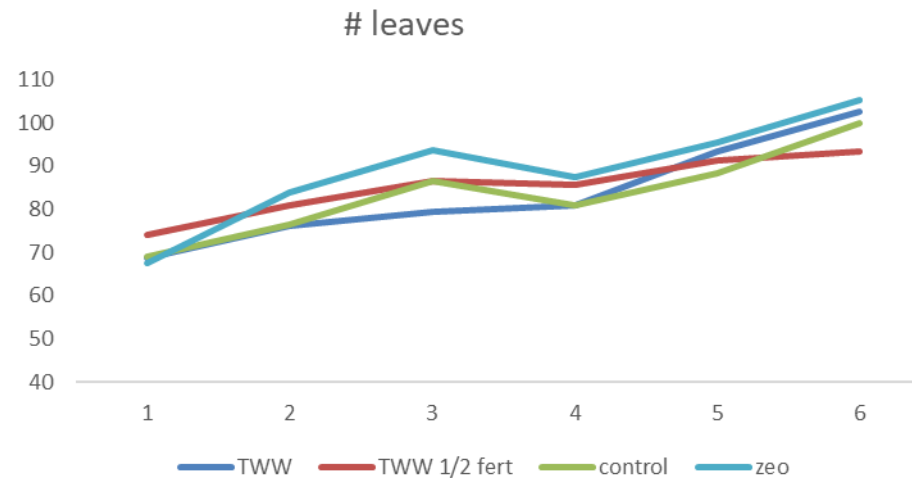
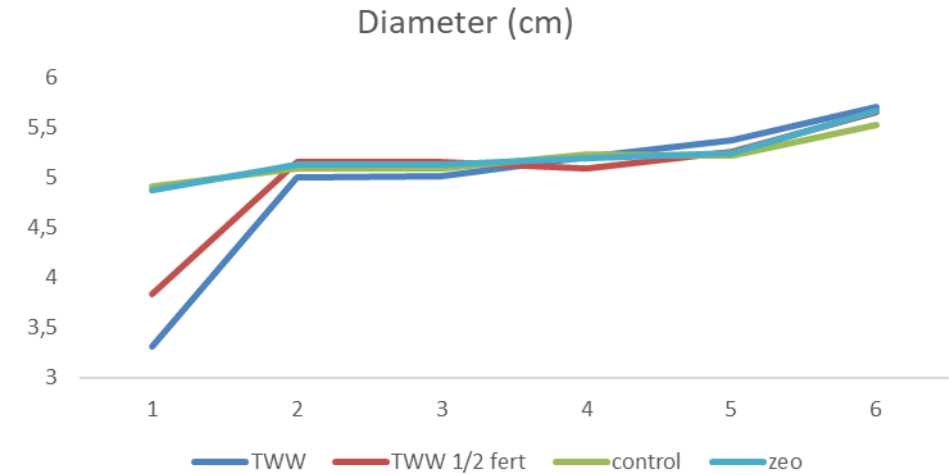
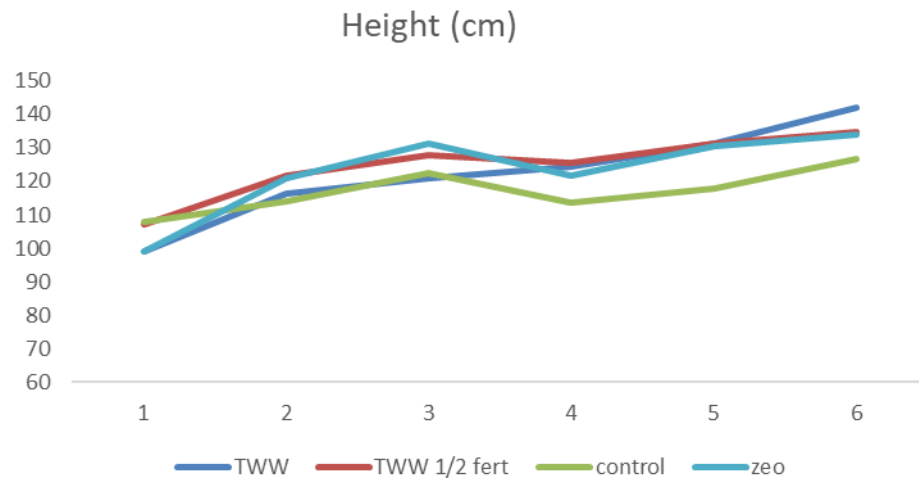
Irrigation of Young Olive Trees with Treated Waste Water

- 2 years experiment (2019-2020)
- Young olive trees (1 year)
- Nursery
- Treatments:
 - Treated Waste Water (TWW)
 - Treated Waste Water ½ fertilisation (TWW ½ fert)
 - Tap Water (control)
 - Zeolithos 5%
- Measurements
 - Height, stem diameter, # leaves
 - Dry weight leaves, stem, roots
 - Pigments (chlorophyll a, b, carotenoids)
 - Leaf area



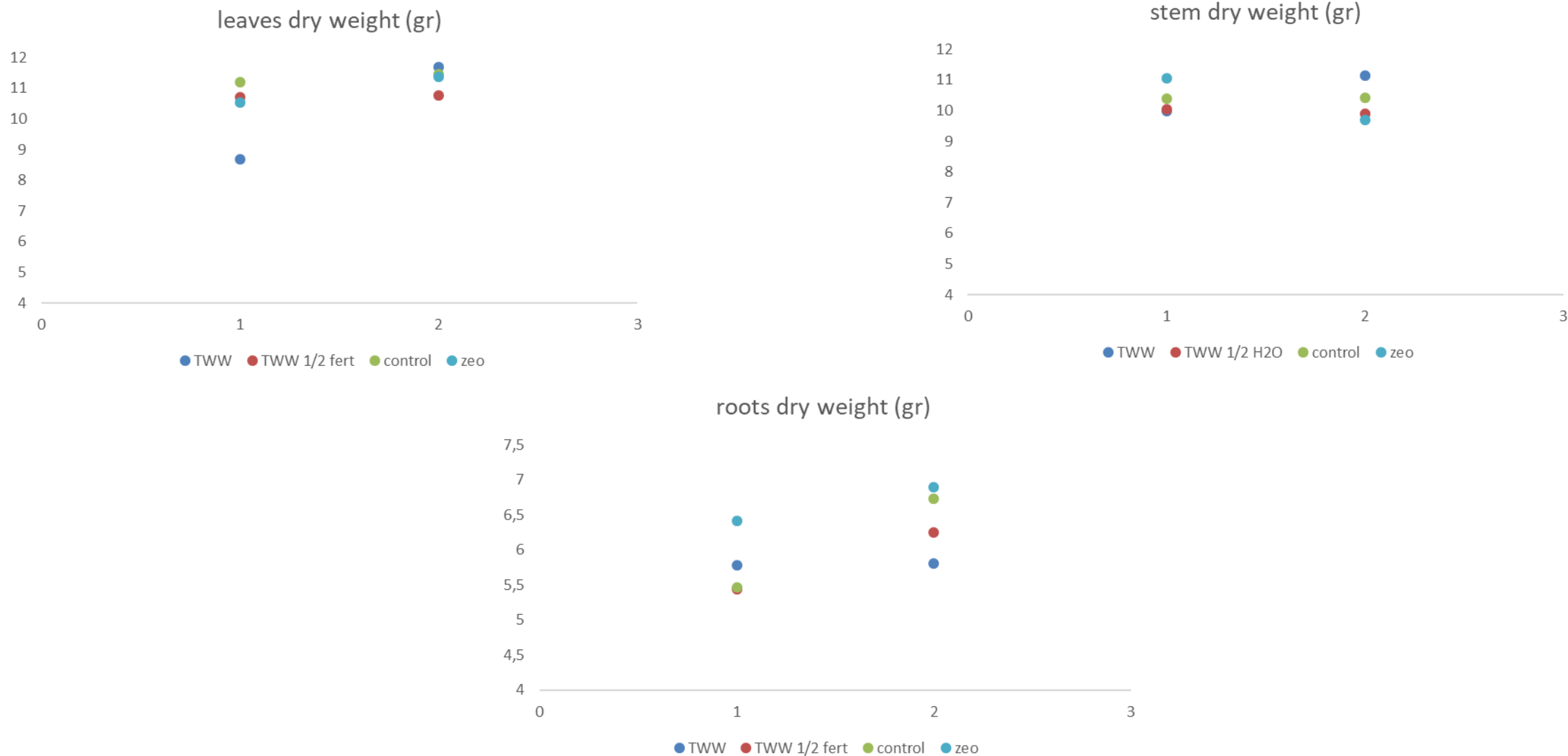
Results

height – stem diameter – # leaves



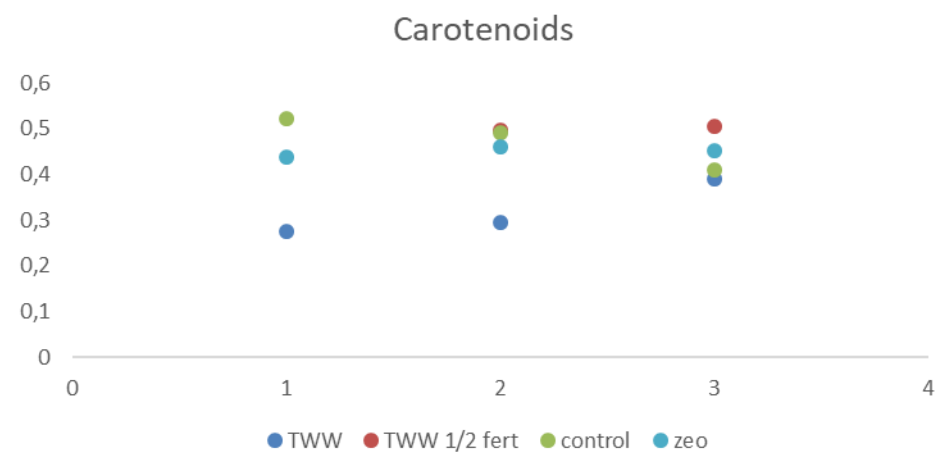
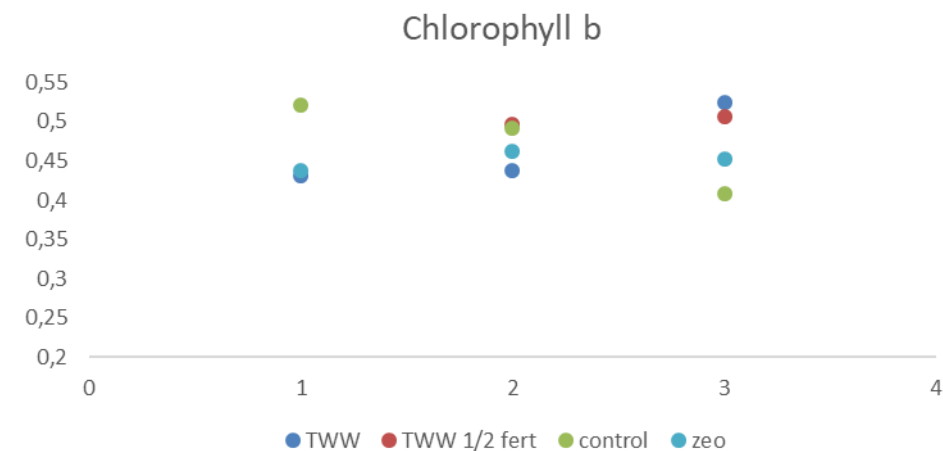
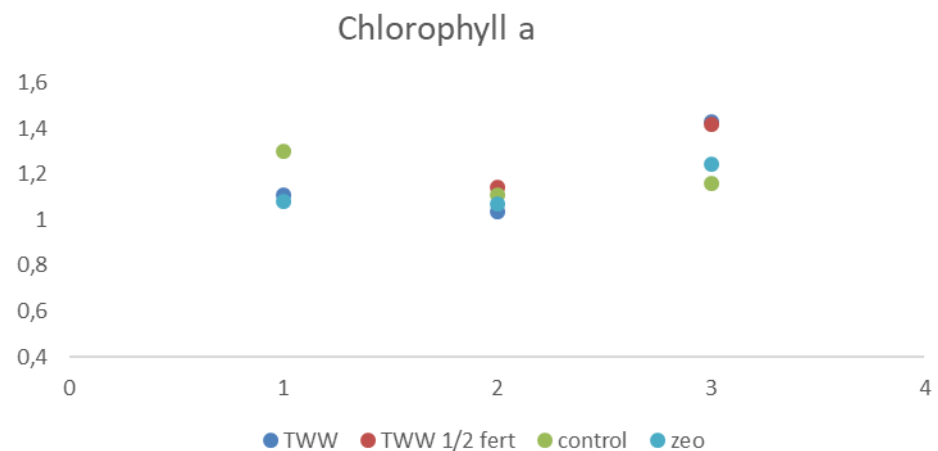
Results

Dry weight leaves – stem - roots



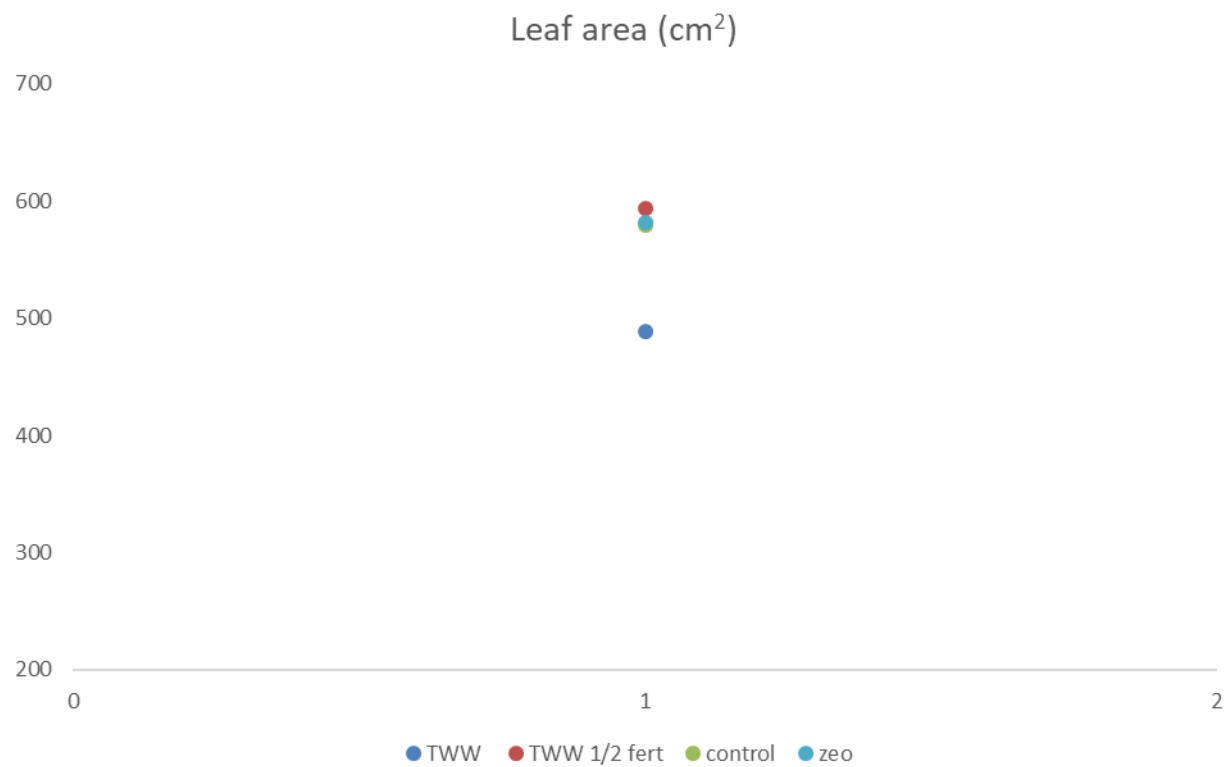
Results

Pigments



Results

leaf area



Conclusion

- No significant difference in growth parameters between treatments
- TWW could be recommended as an alternative water source for young olive trees irrigation



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