

1. The olive-fruit sector

- ✓ In Spain, a surface of 154978 ha is annually dedicated to the olive-fruit sector with a production of 596110 t of olives.
- ✓ Spanish sales range from 1001 to 1132 millions of €, exports are more than 350 thousands of tons annually, being the area with the higher production in the world, as shown in figure 2.
- ✓ The olive-fruit sector generates an appreciable volume of waste water, only in Spain a volume of at least 894165 m³ is annually generated.

This waste water, which is mainly brine with some other components like caustic soda, is currently stored in evaporation ponds increasing its salinity every year and entailing an important contamination risk due to possible overflows.

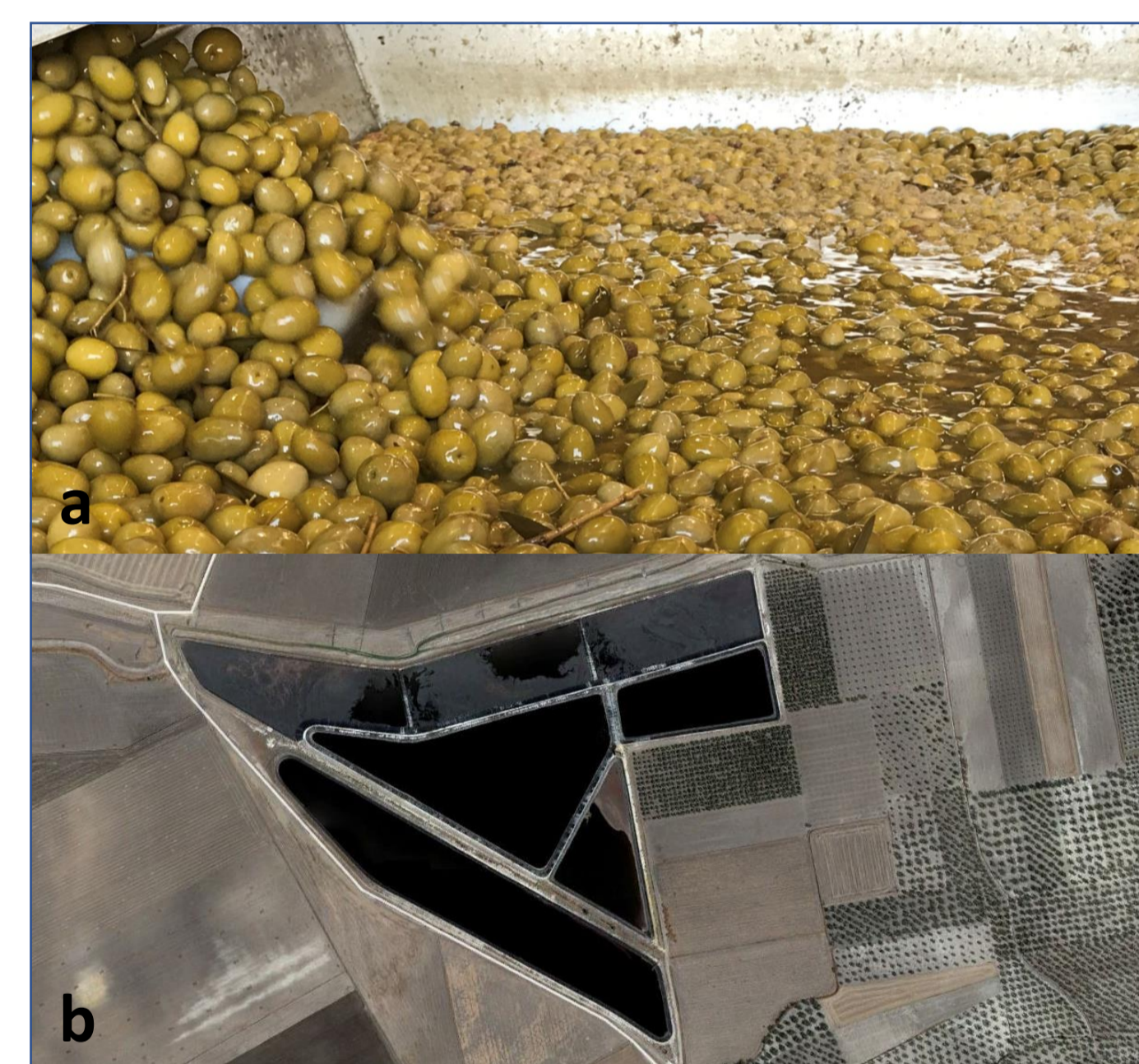


Fig.1: (a) olive-fruit industry (b) olive-fruit industry wastewater evaporation pond of 24 ha located in Andalusia, Spain.

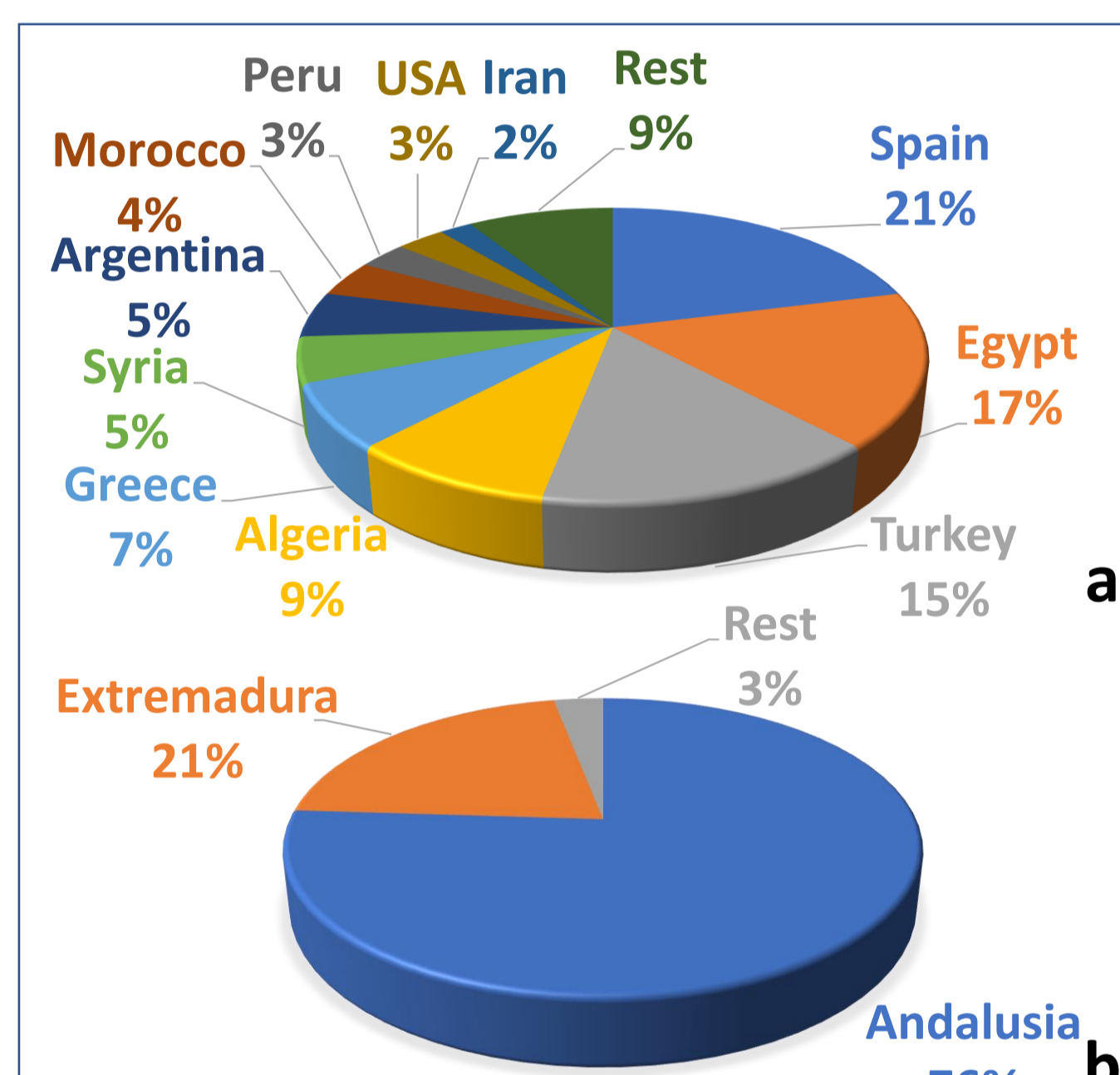
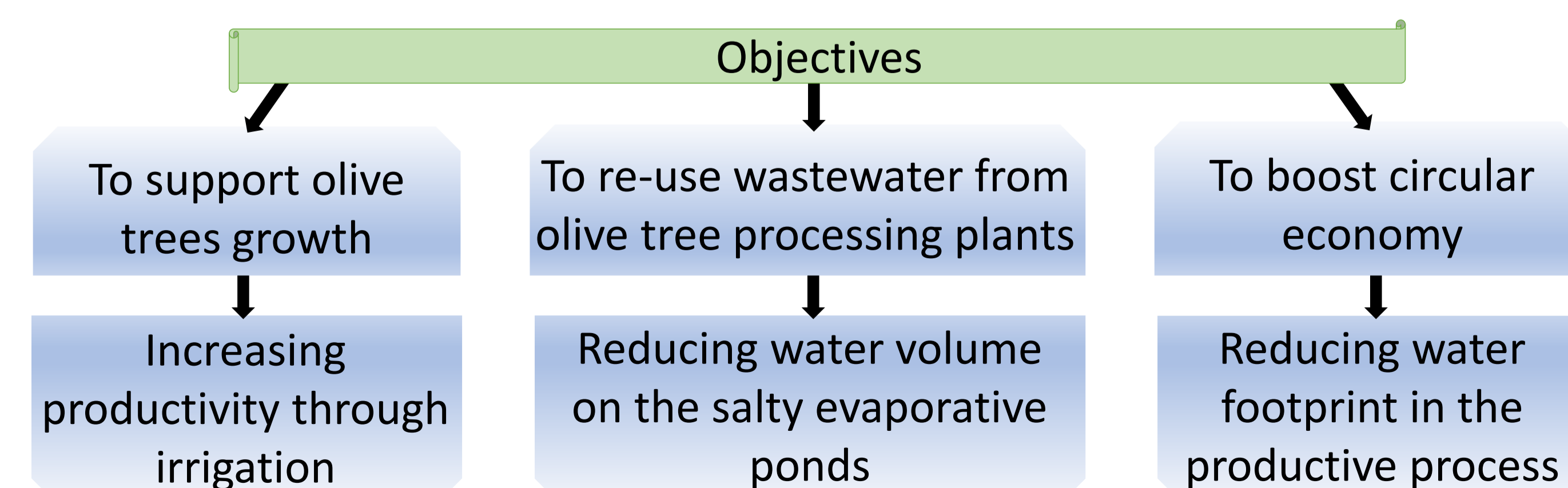


Fig.2: (a) distribution of world olive-fruit production 2012-2017 (b) distribution of olive-fruit production within Spain 2016-17

2. H2Olivetree project

Could current wastewater generated by the olive-fruit sector be re-used for olive-orchards irrigation in regions with seasonal rainfall and long-dry-hot summers?

- This project seeks to understand and assess the salt dynamic in the solution of drip irrigated soils with several mixtures of fresh water and recycled olive-fruit processing water



3. Experimental plots

Eight experimental plots were installed on June 2018, in each one of them, eight olive trees were irrigated with different wastewater concentrations. Three trees are being monitored as shown in figure 5.

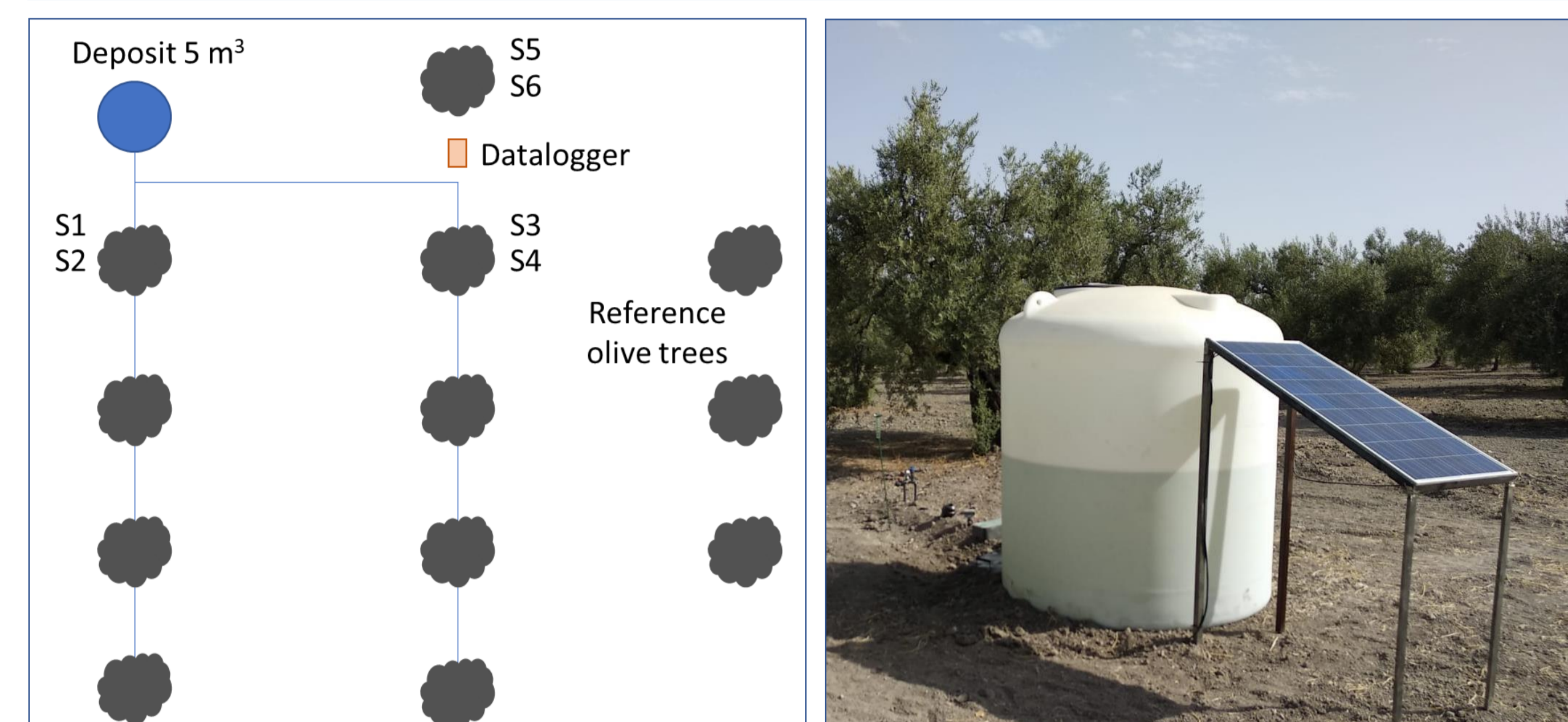


Fig.3: Sketch of the experimental plots

Fig.4: Picture of one of the set-ups

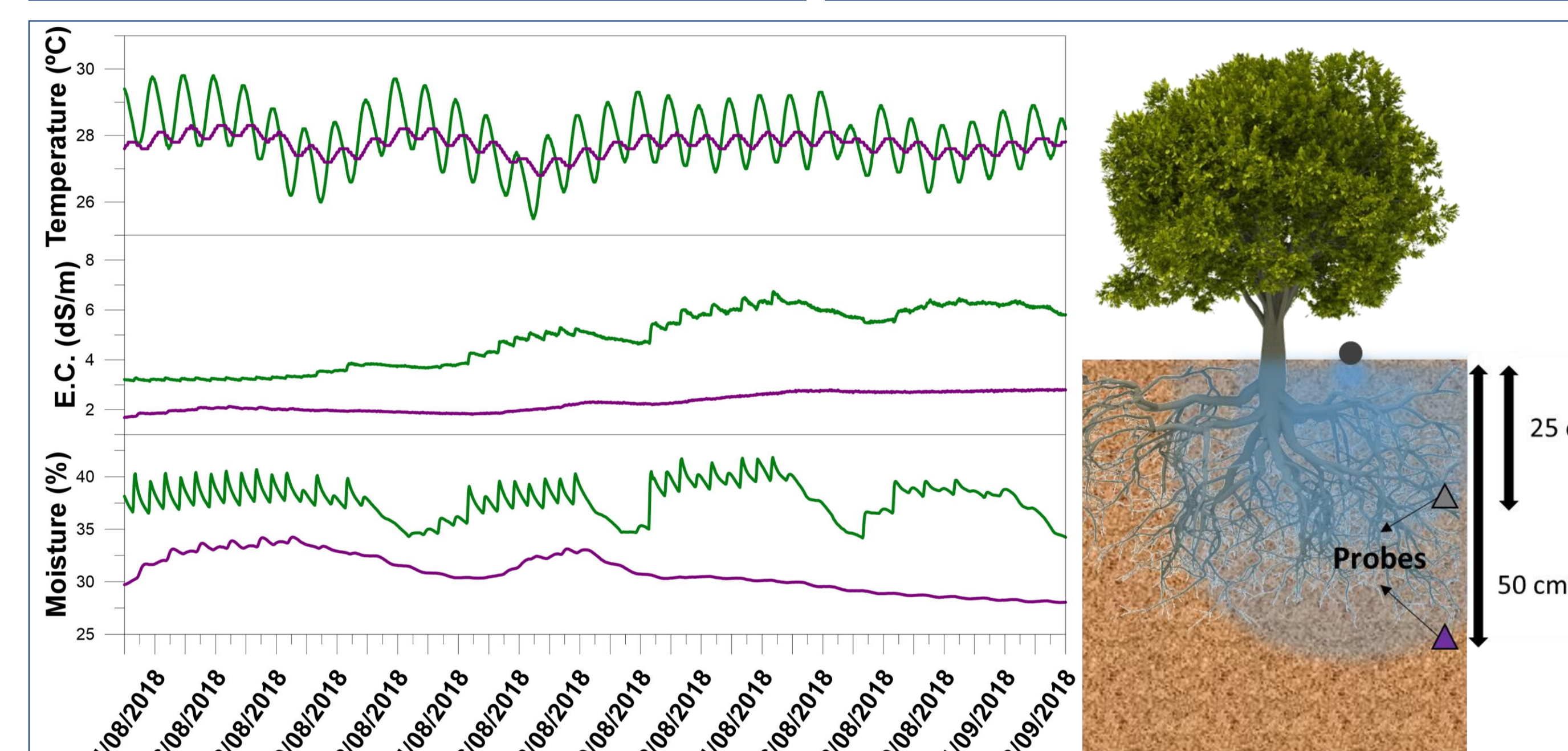


Fig.5: Data obtained from one of the irrigated trees during the first irrigated summer period, at two different depths 25 and 50 cm. Colours in the image to the right show correspondent depth in the graph.

4. Results & discussion

- An increase on the electrical conductivity of the soil solution in all the plots from the beginning with the range 1-3 dS/m, to the end of the irrigation period with the range 3-13 dS/m was measured.
- Rainwater in autumn and winter was expected to lixiviate the solutes stored in the soil. A decreasing trend on solute concentration has been shown in all plots, but not all the accumulated solutes have been lixiviated. The climatic characteristics of the present year could explain this behaviour; most of the events occurred in the month of October, when evapotranspiration in the area is still very high, with values up to 5.5 mm/day, and the rest of autumn and winter were very dry.
- Sparse rainfalls during the rest of autumn-winter have partially moved solutes

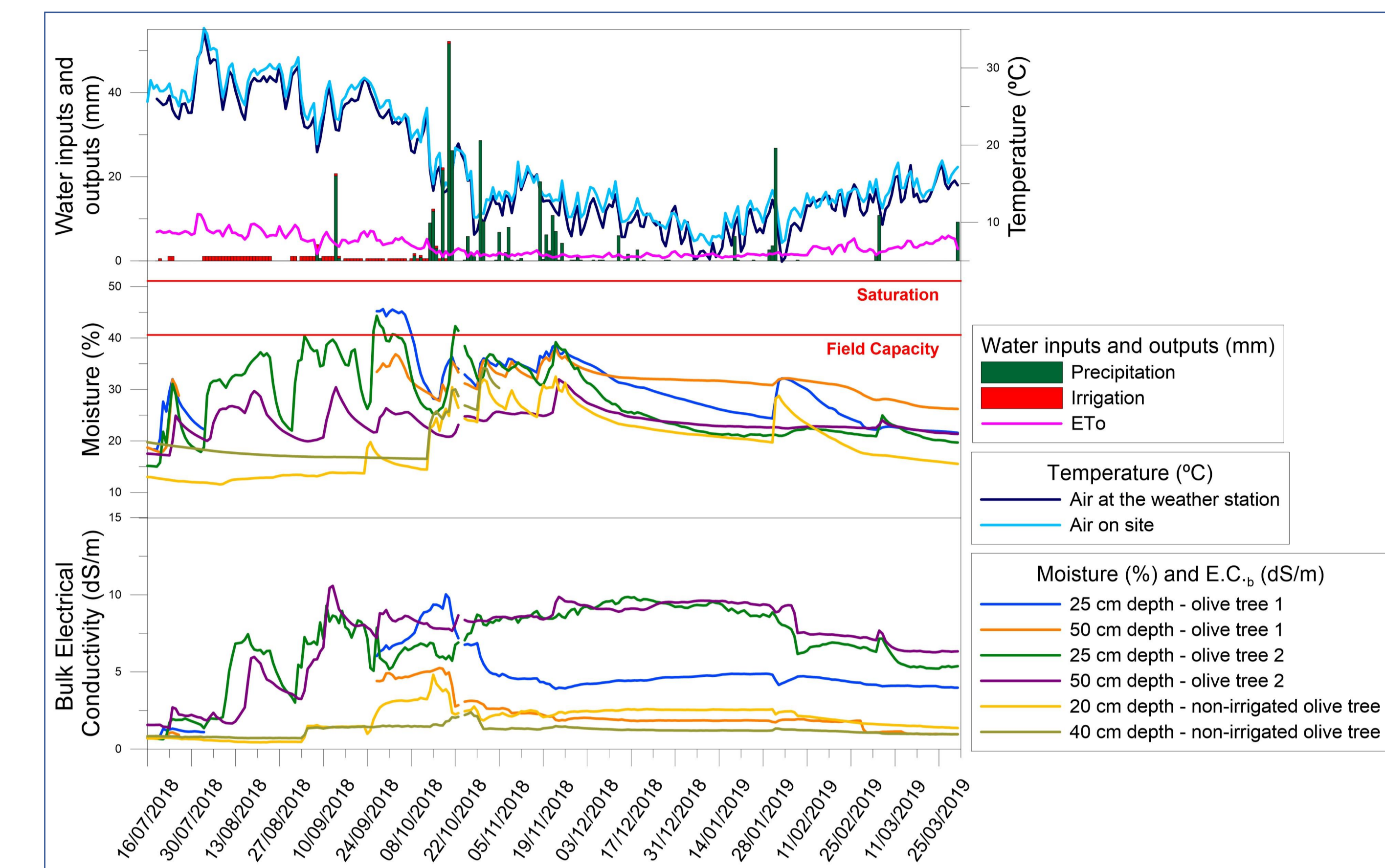


Fig.6: Evolution of electrical conductivity and moisture, of one of the sites, since the beginning of the experiment. Climatic conditions for the site are shown on the top graph.

- The electrical conductivity of water for irrigation varied within 7-13 dS/m.
- Measured olive-fruit increased by 22% in weight, 3% in length and 5% in width
- Regular soil and foliar analysis are being carried to account for any nutrient deficiency.

5. Key findings & outlook

- ✓ Olive trees respond to irrigation with an increase on olive size and weight.
- ✓ Solute concentration on the soil surface increases in the first place and starts decreasing with rainfall later.
- ✓ There was an increase of the electrical conductivity of the soil solution in all the plots from the beginning with the range 1-3 dS/m, to the end of the irrigation period with the range 3-13 dS/m.
- ✓ Although solute concentration is a cause of concern, solute concentration has decrease with the last rain events.
- ✓ Irregularity on this year meteorology, with a very dry late autumn and winter, does not allow to a generalization of results.
- ✓ More data is needed to characterise the movement of solutes in the soil, and regular autumn-winter seasons must be observed. More data will be collected during 2019-2020.
- ✓ Water used in the olive-fruit industry does not have the same concentration of solutes throughout the year, separating olive washing waters could be an better option to re-use it for irrigation.

6. Acknowledgments

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