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Aim of the study

This study investigated the energy produced by different configurations of above-canopy photovoltaic arrays and their effect on transpiration of pear trees.

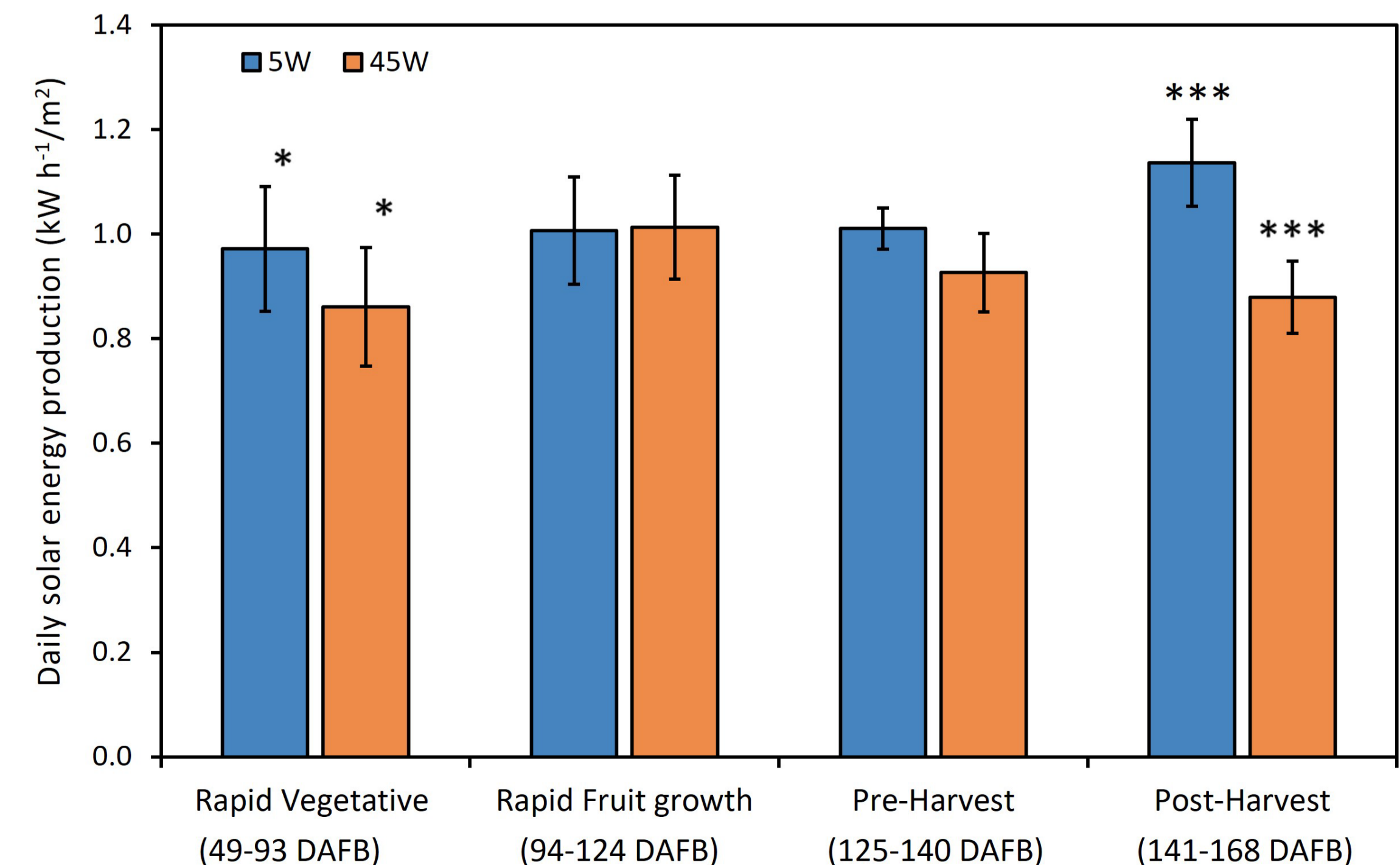
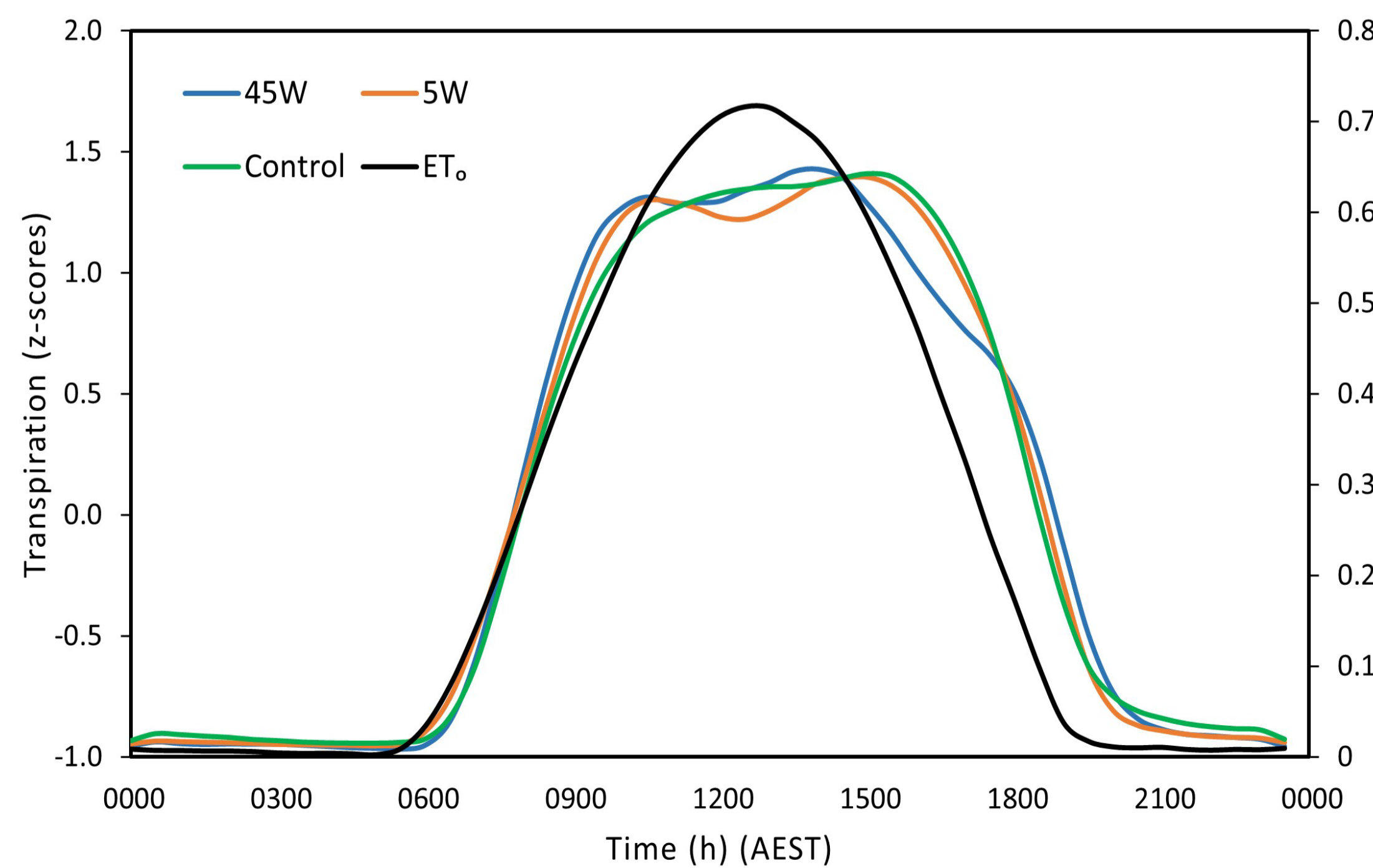
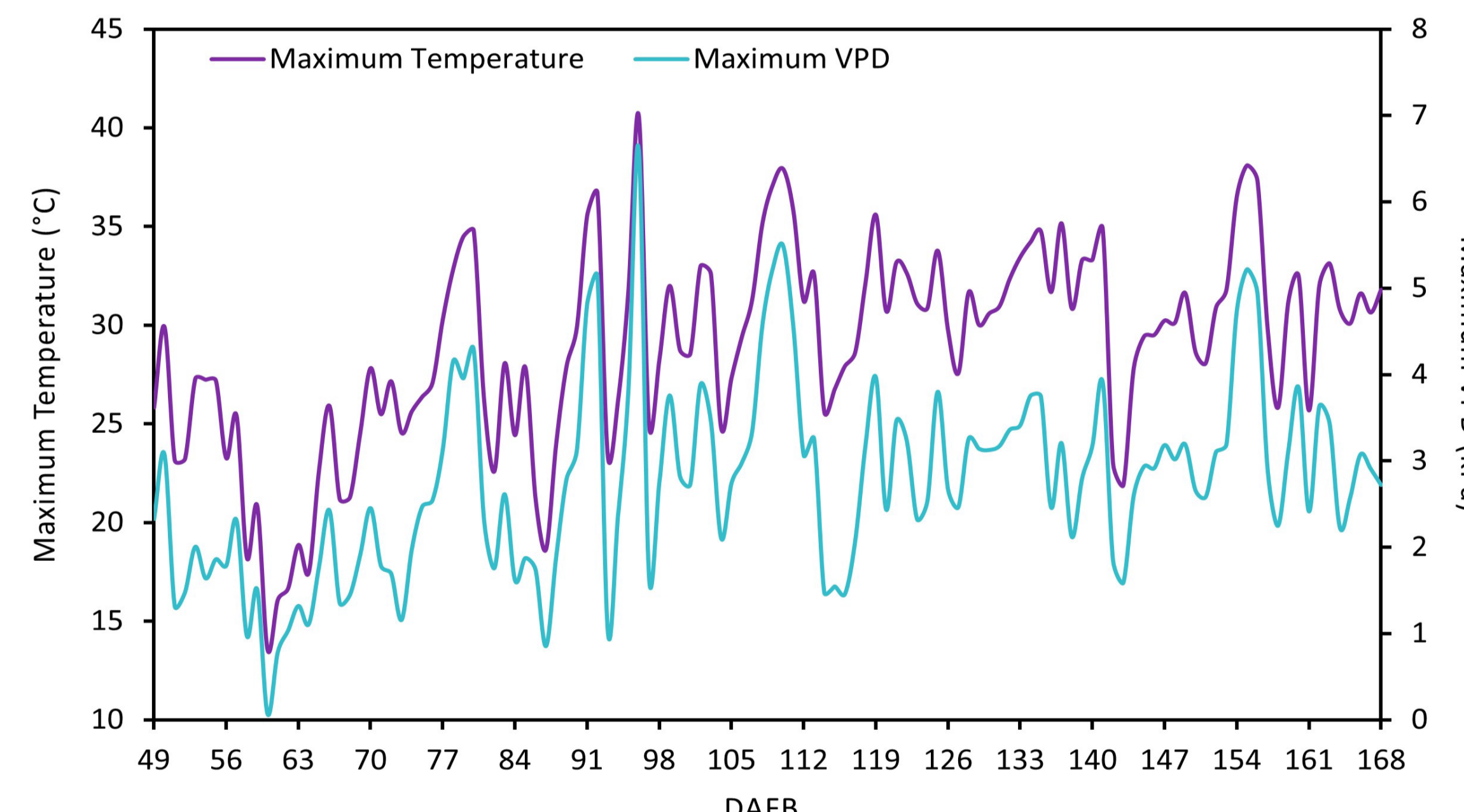
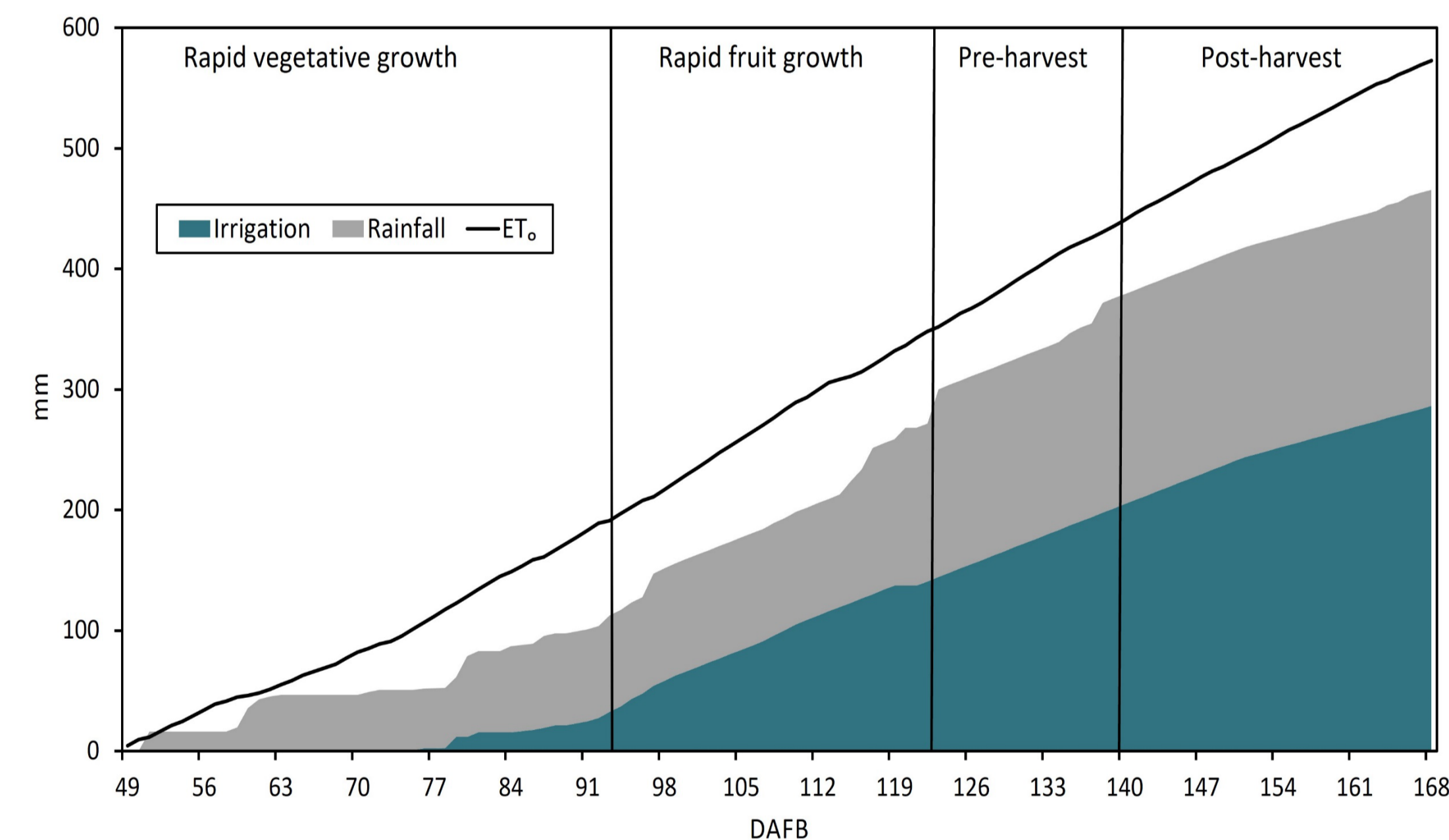
Materials and methods

Experiment conducted in 2021–22 at the Tatura SmartFarm, Goulburn Valley, Victoria, Australia.	Cultivar: 'ANP-0118' (marketed as Lanya™). Rootstock: BP1.
Open Tatura trellis, four-leader system.	Row spacings: 4.5 m. Tree spacings: 1 m.

- Heat Pulse Velocity (HPV) probes were used to measure transpiration.
- Probes had four thermistors positioned at 5, 10, 25 and 40 mm depth.
- Four probe set were installed per tree in 2 trees per treatment.
- Reference crop evapotranspiration (ET_0) was calculated from weather measurements in the orchard.
- Solar panels had power rating of 196 W per m².



Results



- Transpiration of pear trees under different treatments followed a Gaussian curve during the daytime.
- There was a time lag between the ET_0 and transpiration during early hours of the day and in late afternoon.
- Maximum transpiration of control and 5W treatments was recorded during late afternoons — between 1500 and 1700 h AEST.
- Transpiration of 5W trees dipped at solar noon and subsequently recovered in late afternoon which is in line with the expected maximum shade of 5W to the trees at solar noon.
- Transpiration of 45W trees declined in the afternoon, at approximately 1500 h AEST in line with the expected shade from the adjacent row.
- 5W produced 6% and 13% more energy than 45W during the rapid vegetative growth and post-harvest stages, respectively



Four HPV sap flow sensors were installed per tree in 2 trees per treatment.

Conclusions

Shading from above-canopy photovoltaic arrays affected tree transpiration. Overall, transpiration was highest in the afternoons in the control and under the 5W photovoltaic arrays whereas, trees under 45W photovoltaic arrays were able to mitigate water loss at this critical time of the day.