1ST LENSES E-DIALOGUE WEBINAR:

ADOPTION OF WATER-ECOSYSTEMS-FOOD-ENERGY NEXUS IN AGRIFOOD SYSTEMS ACROSS THE MEDITERRANEAN BASIN

18 January 2023
h. 10:30 CET

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Nectarine Response to Partial Shading by Agro-Voltaic Panels

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Idan Kopler and Giora Rytwo,

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MIGAL
Galilee Research Institute

PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA

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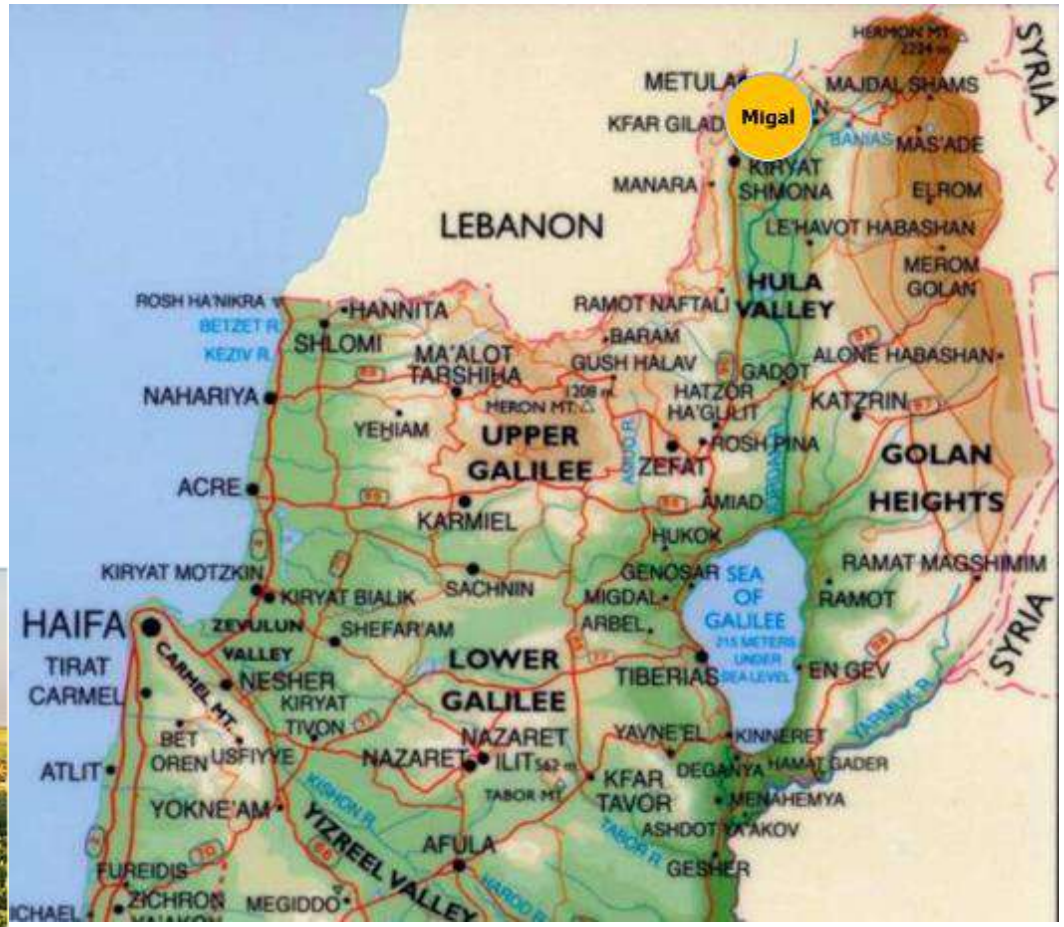
MIGAL in the Galilee, Israel



Peripheral region with science, agriculture and industries

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The holistic Water-Energy-Ecosystems and Food Nexus approach of the Galilee Pilot

- The Water-Energy-Food-Ecosystem (WEFE) Nexus offers an integrated approach analyzing the synergies and trade-offs between the different sectors in order to maximize the efficiency of using the resources, whereas adapting optimum policies and institutional arrangements.
- The Mediterranean is a region where we observe a large spectrum of issues emanating from water scarcity, especially in the orchards fields, large amounts of food loss and waste and increasing demand for energy and food.
- Our initial results showed the possible saving of water for irrigation by using panels for shading.

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The benefit of installing APV for orchards

The principle behind APV is straightforward: the smart combination of agriculture infrastructure with photovoltaic installation. This combination unlocks a variety of disruptive application that capitalise on synergies between solar and agriculture. APV allow for solar to be combined with specific rural and agricultural activities, providing solutions to the needs of farmers and rural communities by increasing the resilience of agricultural activities to climate change. The system in orchards will promote the multiple synergies between agriculture and solar electricity generation, enabled by the APV systems, for saving water and better fruit production.

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Summary and conclusions 2021

- In the second season of agrovoltaics cultivation of a “wall” type trained plum orchard at Ayelet Hashahar the PV panels were replaced with opaque tarps.
- Fruit set was delayed by two weeks probably because of night cooling obstruction by the covers.
- Paneled and sunlit sections were irrigated with the same driplines and water amounts. All the indicators: soil moisture, plant stress, fruit growth rates, prune weight and ET recording instruments point to considerable less water use and enhanced vegetative growth in the paneled sections.
- Paneled trees yield was 38% less than the sunlit plots, partly because reduced fruit numbers at hot weather in fruit set time.
- **Future research has to quantify the potential water saving, develop protocols for irrigation optimization and adjust cultivation measures to fruit growth and maturity under partial coverage.**

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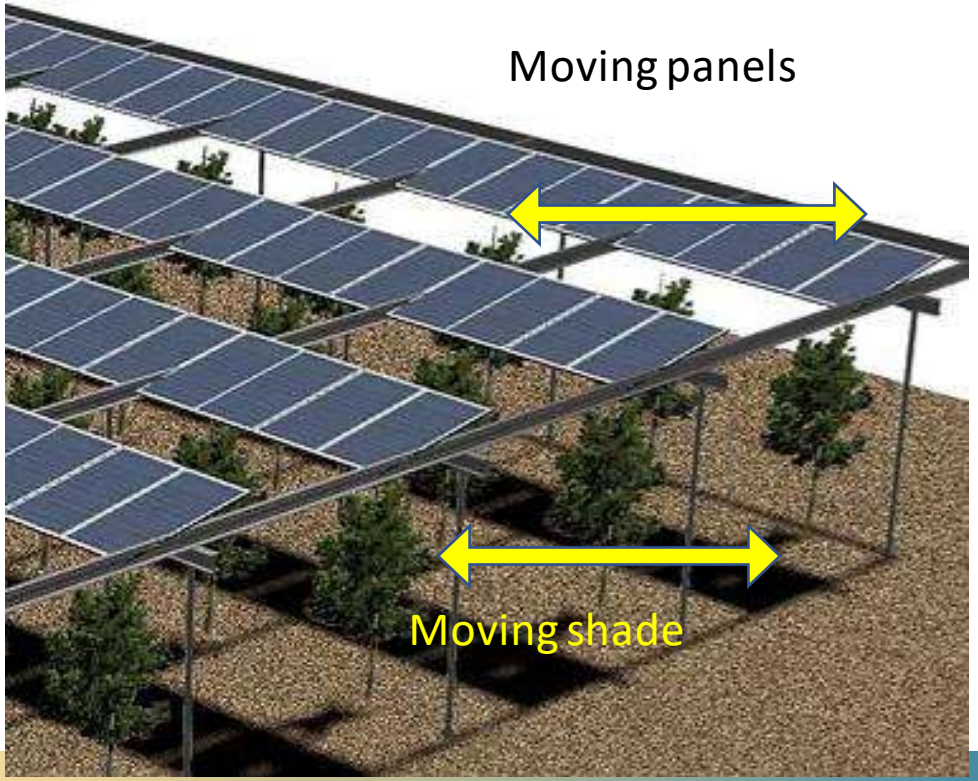
Objectives for 2022 season

- New location: Plot in Ayelet Hashahar had to end due to lack of building permit therefore we are moving the experimental site to a Nectarine plot at Kibbutz Yiftah, which already has a pending permit.
- New technology:
  Horizontally moving panels, shading programmable day and night.
- The technology is presented by Agri-light company.



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Objectives for 2022 season

- Water use regime characterization of fruit crop under partial shading of PV panels;
  - Water amount application to recommended +/- 25%;
  - Monitoring water uptake, soil, plant and atmosphere data to evaluate optimal water needs of shaded vs. sunlit trees
- Development of irrigation scheduling indicators for orchards mounted with PV panels:
  - Crop coefficient (Kc) relation to PAR interception;
  - Test of determination methods.

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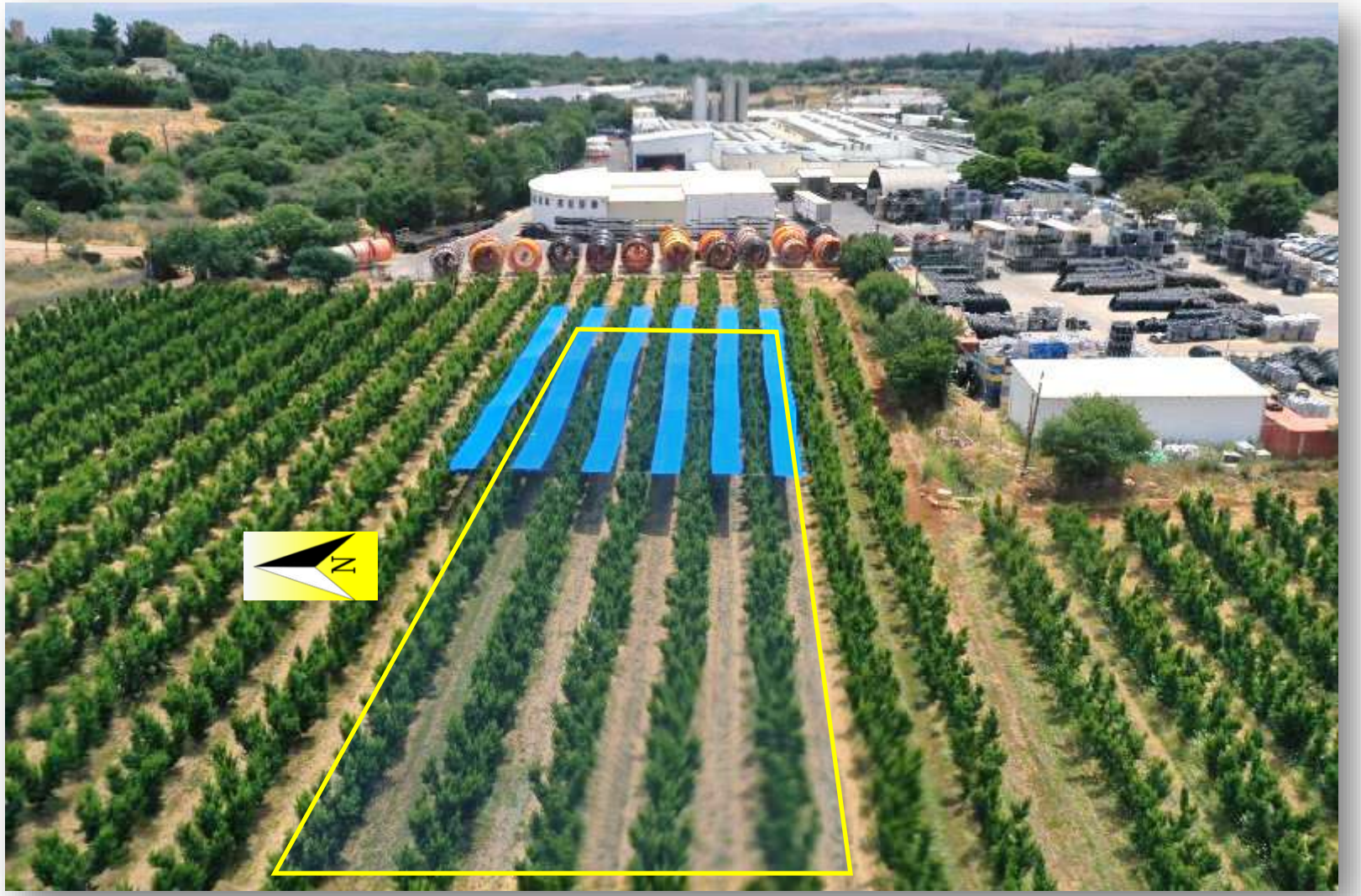
Overview



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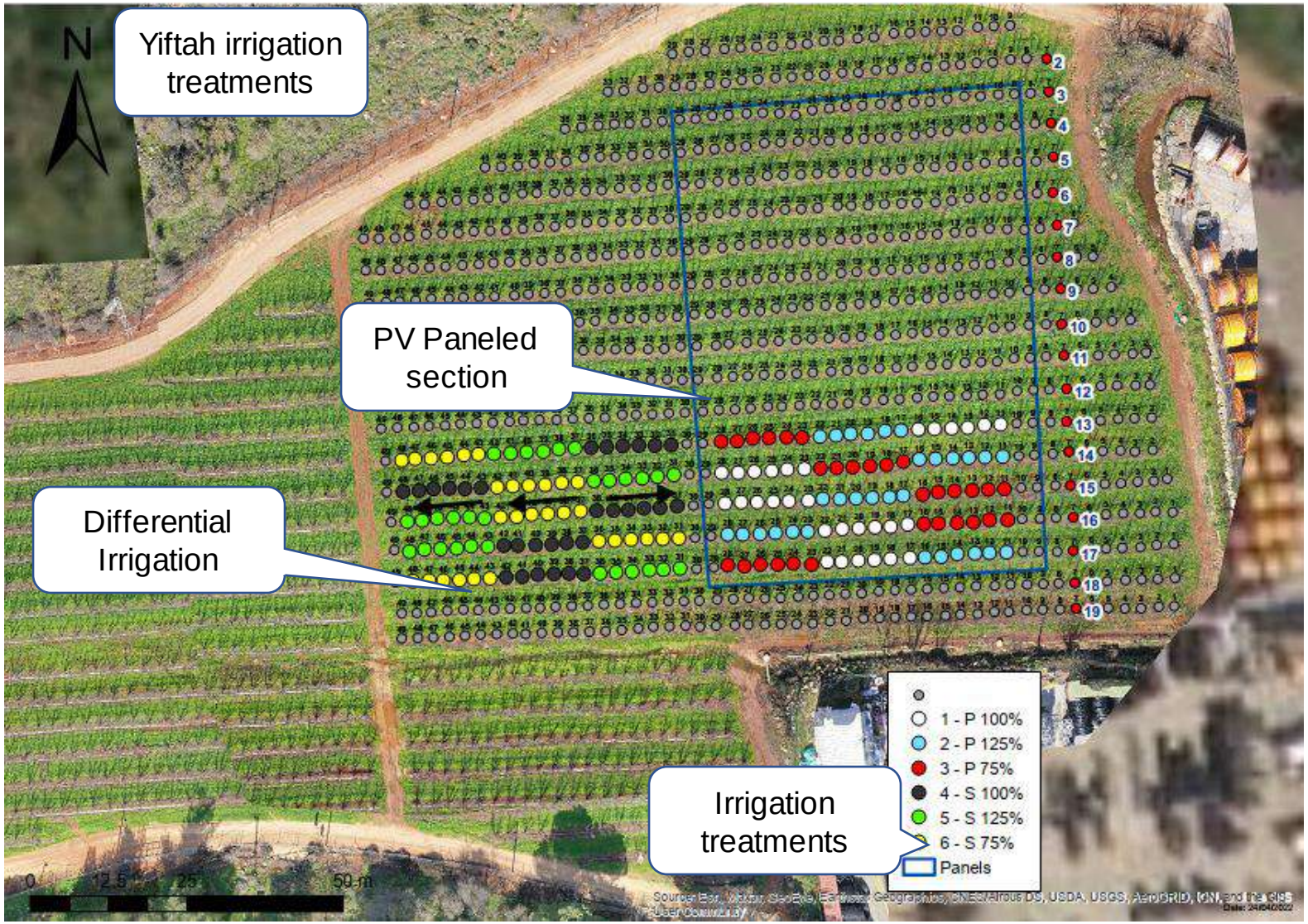
Treatments layout



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Shading 2/9/2022 11:00

South side

North side

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Sensor layout

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Meteorological stations

Eddy-convariance station

Metrological station (in sun)

Metrological station (in Shade)

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Different systems in the orchard

Movie

PAR interception linear radiometer

Stem Water Potential

6 irrigation separate controls

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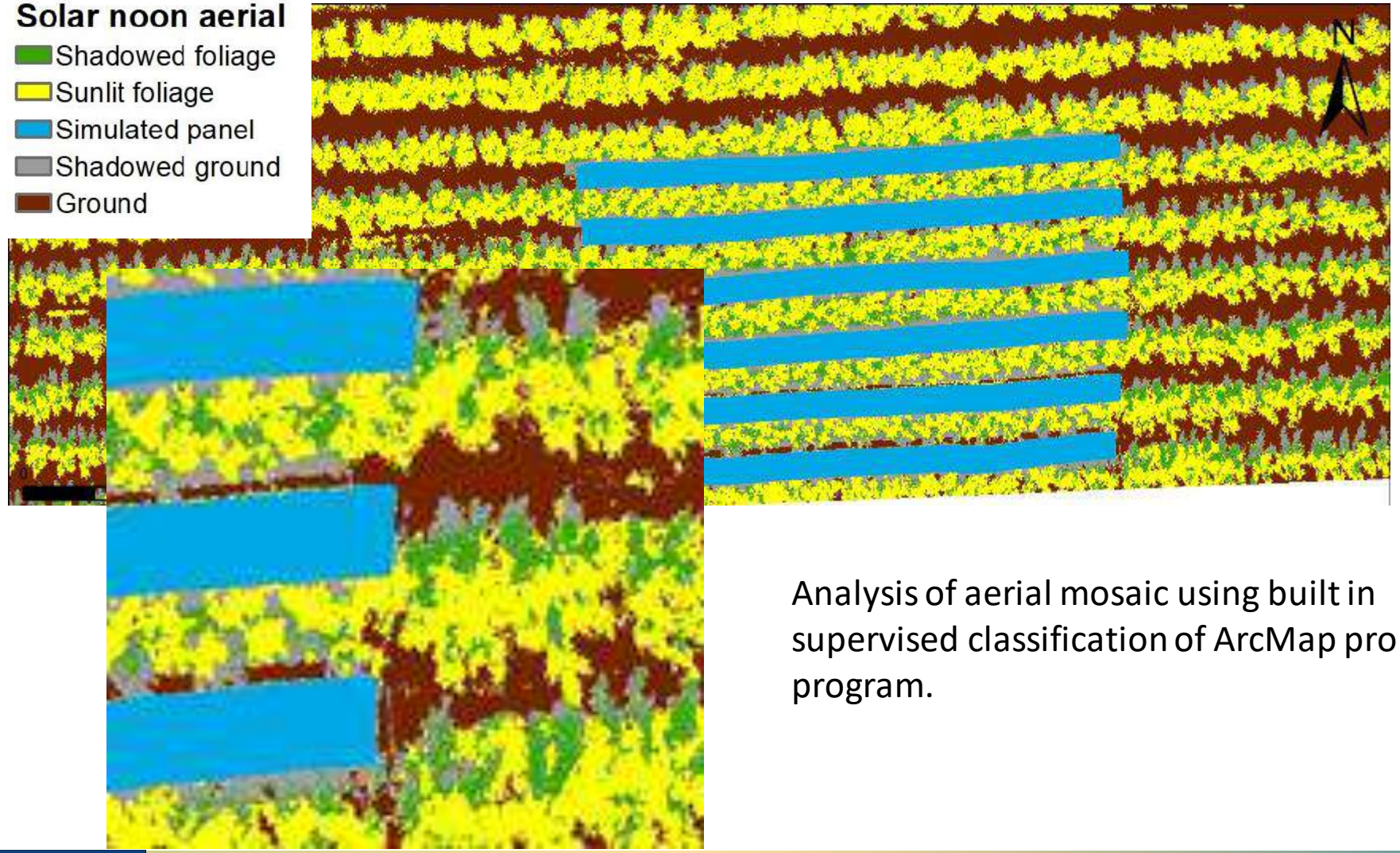
Midday illumination survey



Analysis of aerial mosaic using built in supervised classification of ArcMap pro GIS program.

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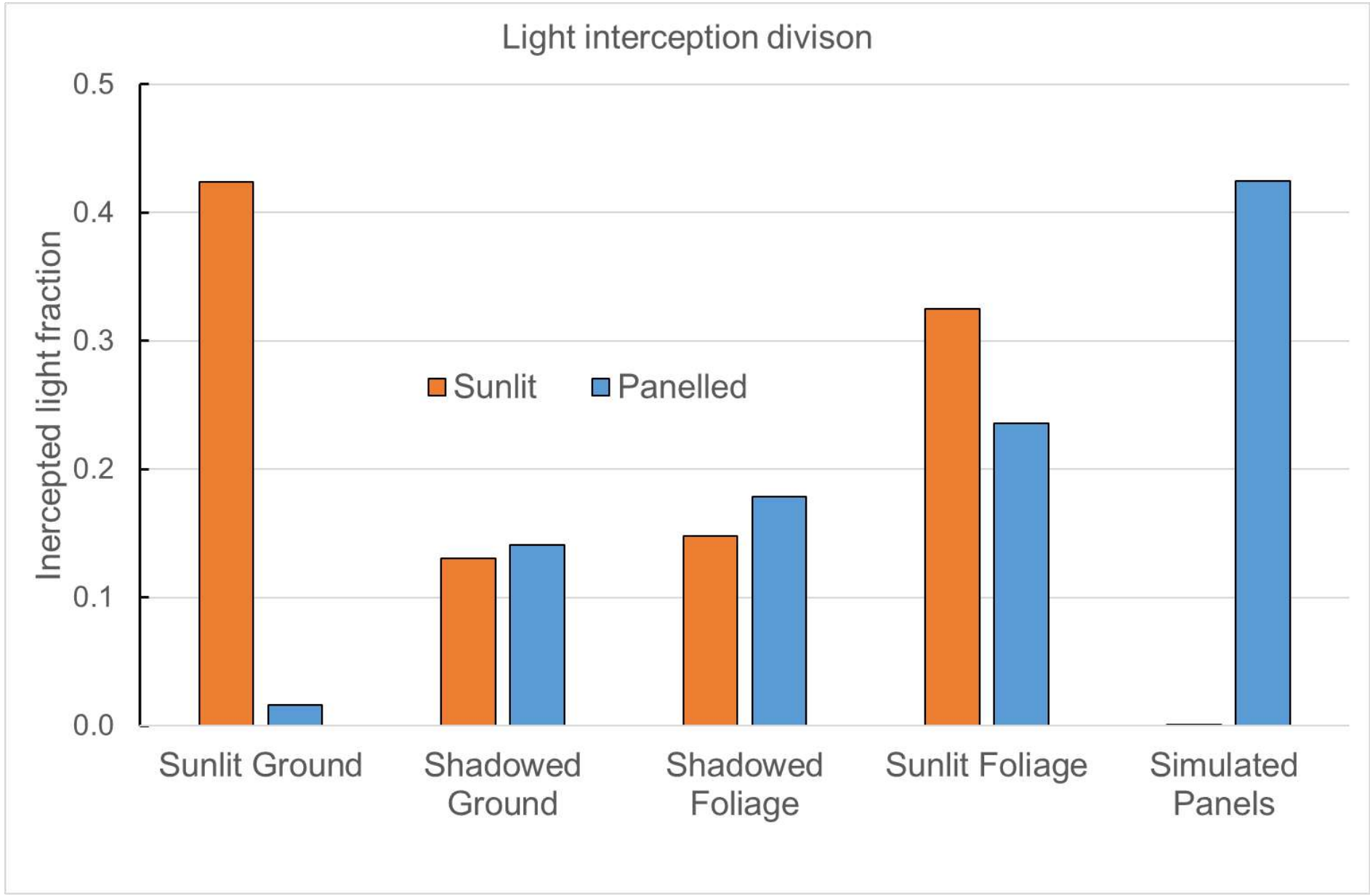

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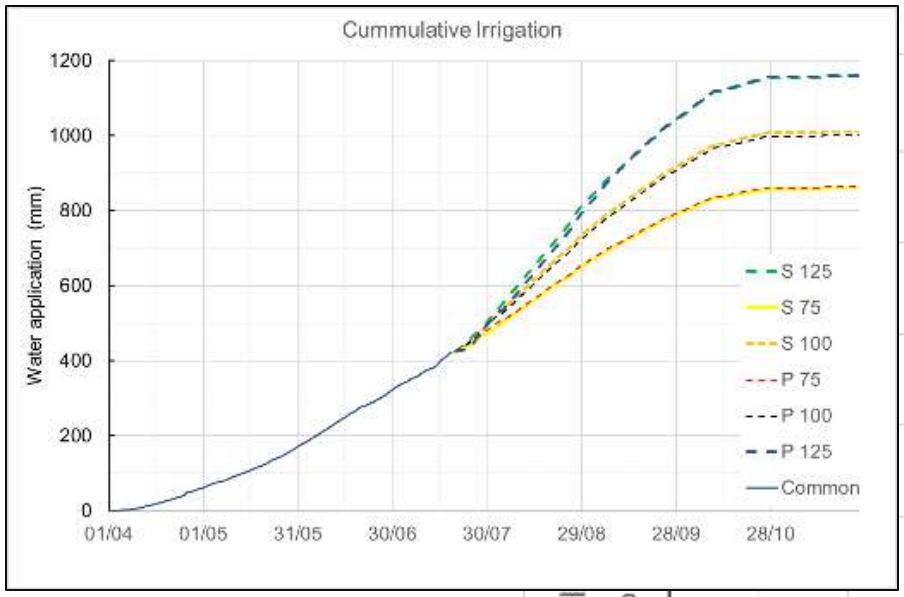
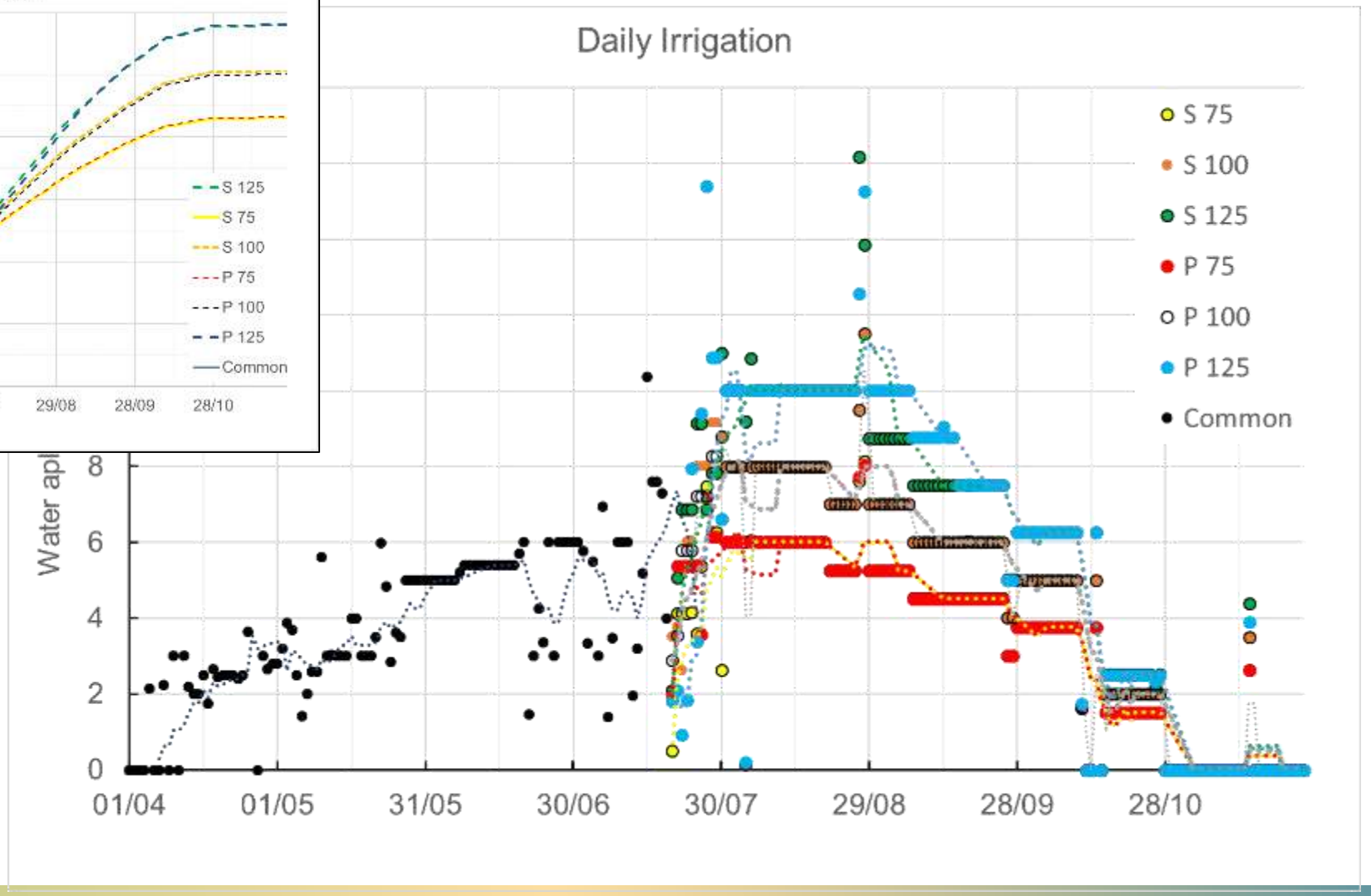
Irrigation history





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Soil water data

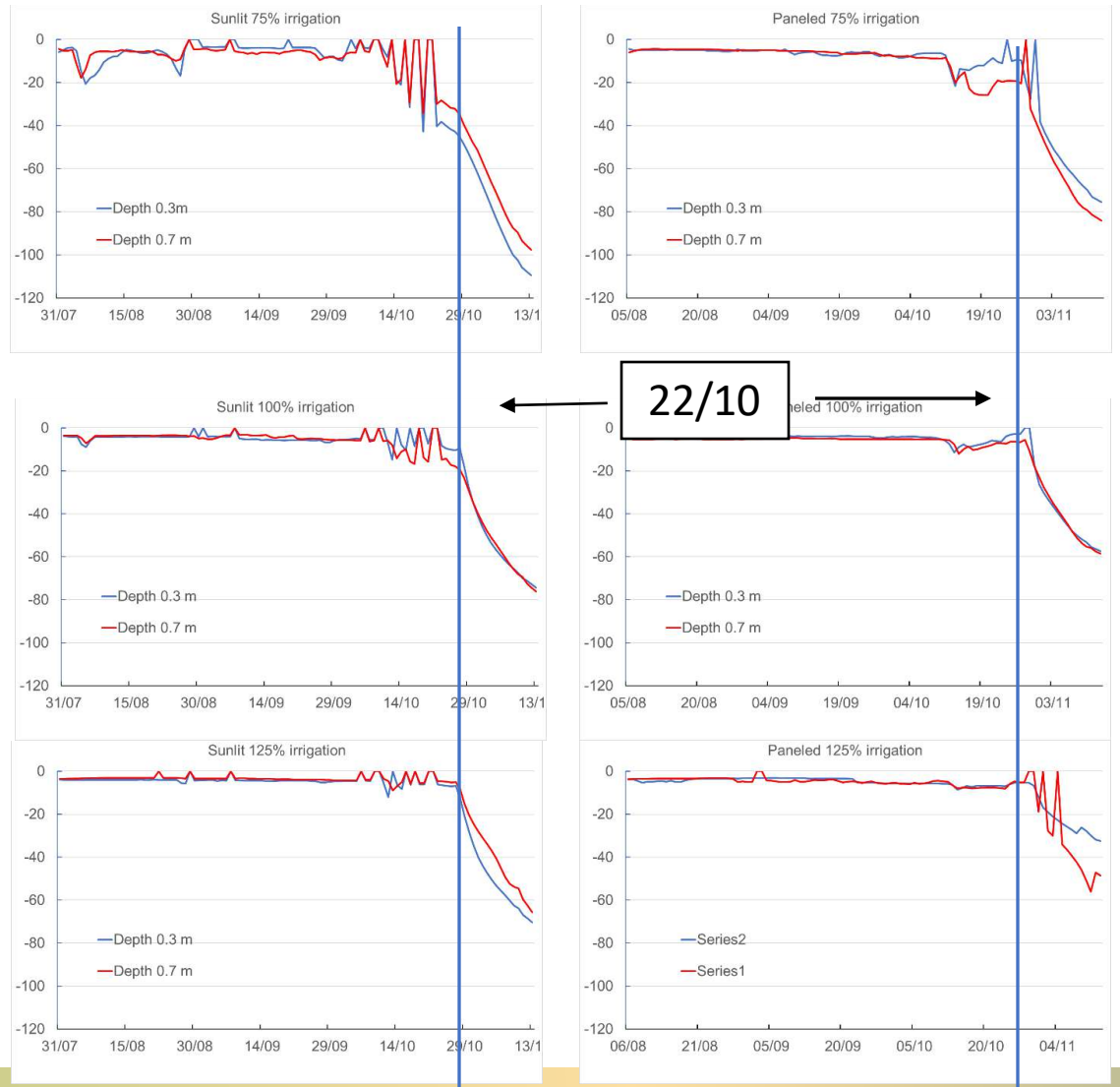
Sunlit

Paneled

75%

100%

125%



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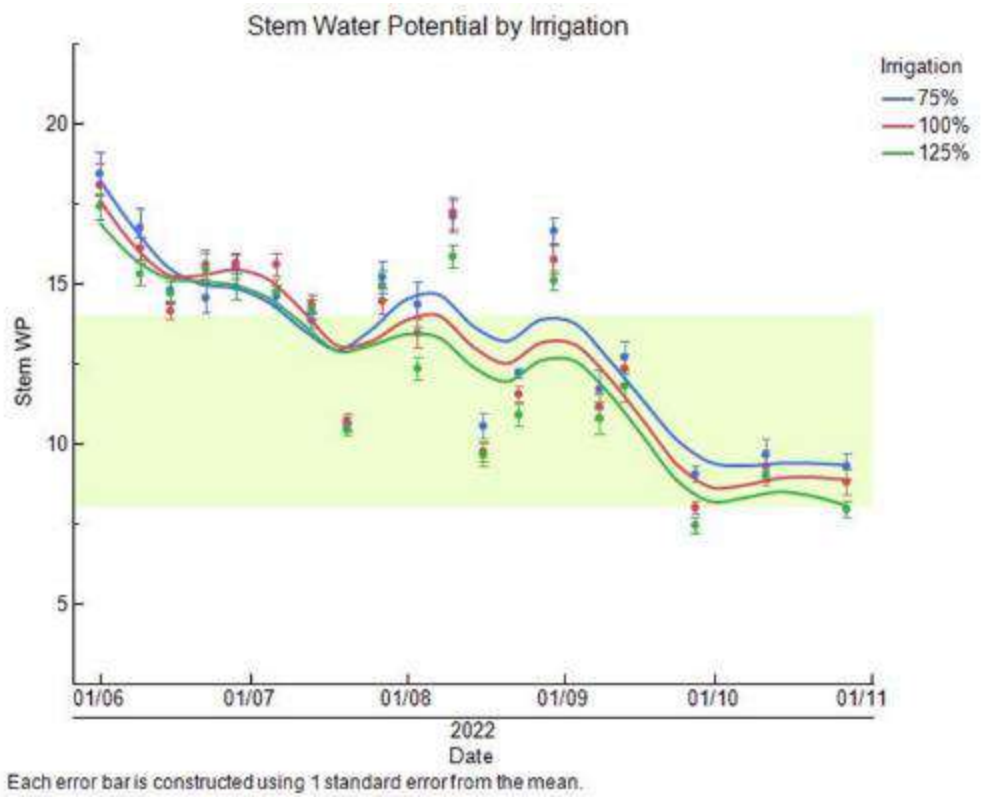
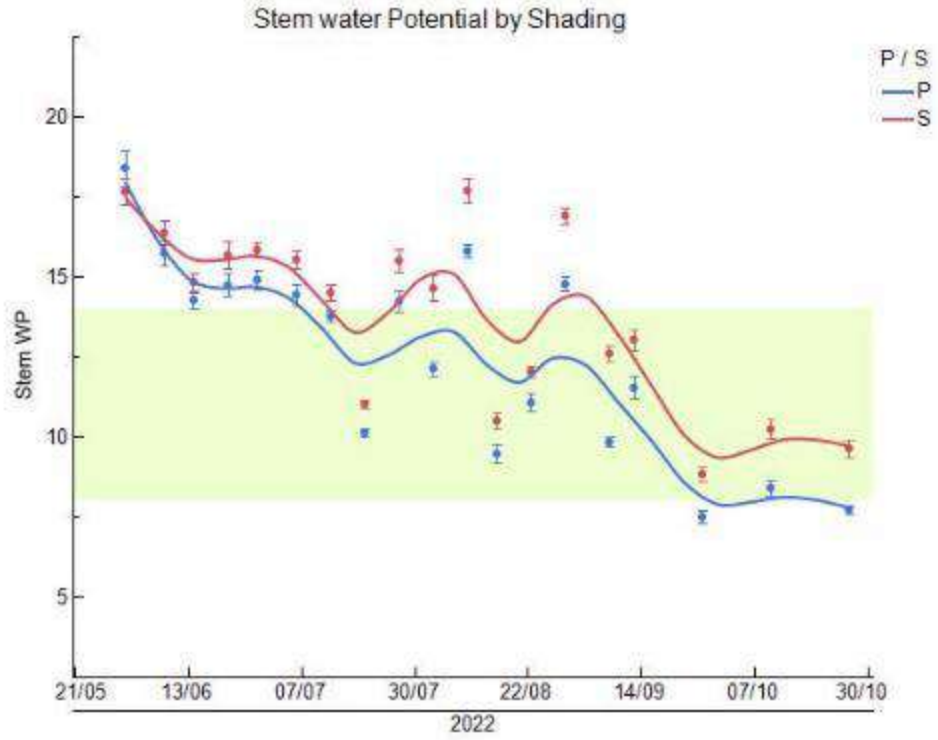
Stem Water Potential

Irrigation



Simulated panel shading



SWP differences significant with $p<0.05$

No irrigation X paneled treatments interaction

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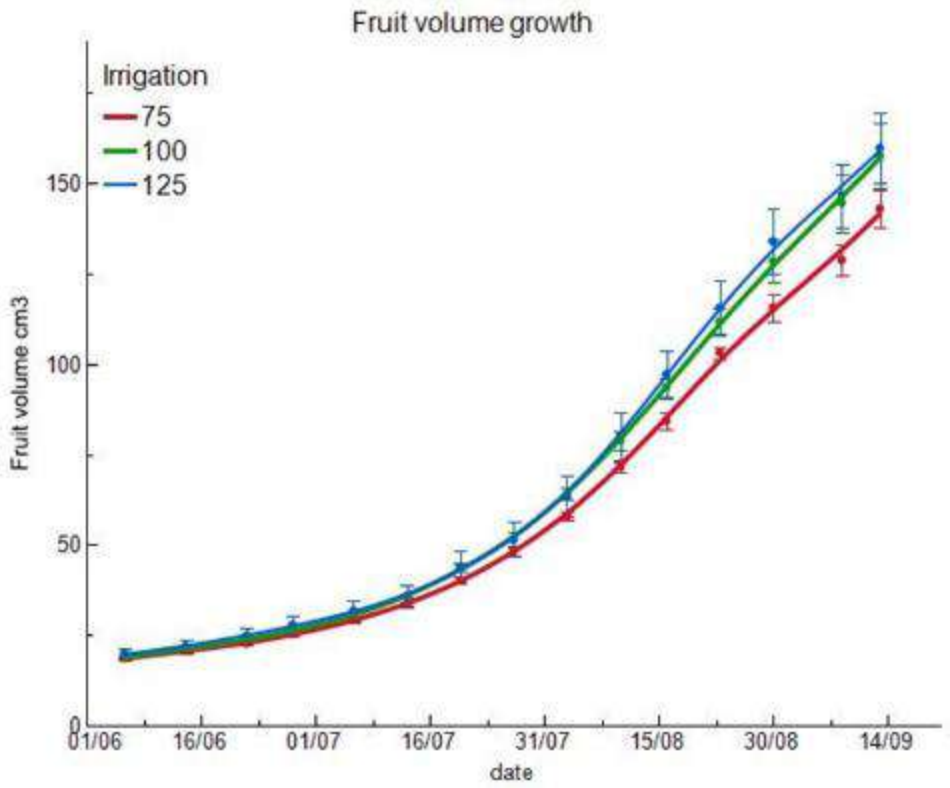
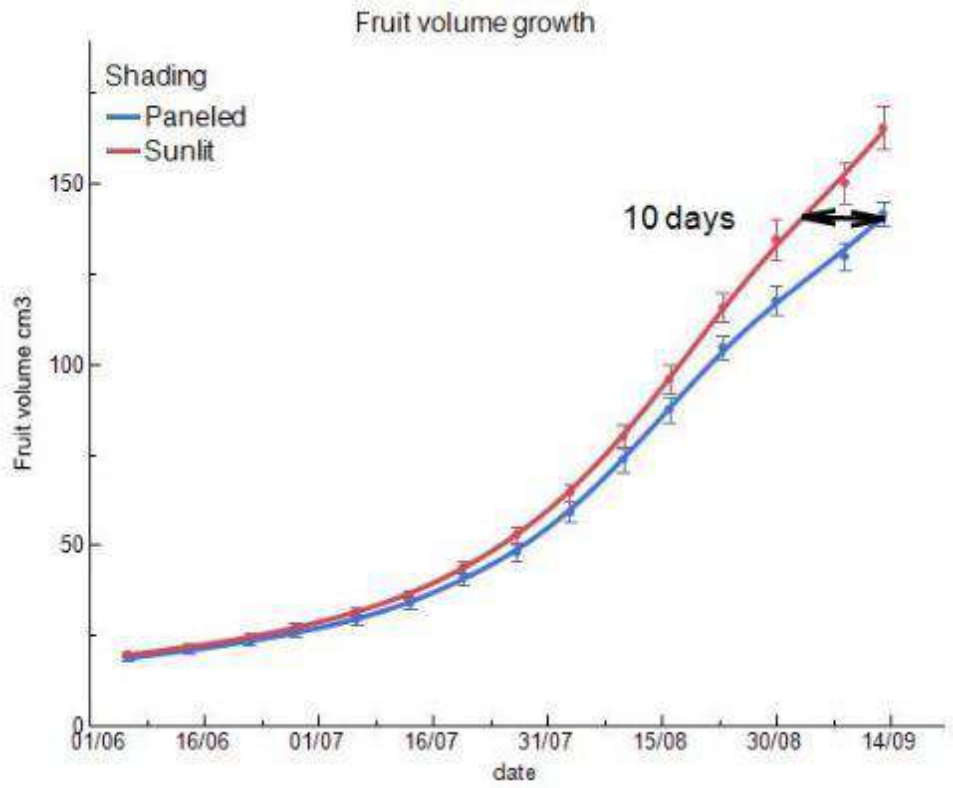
Fruit volume growth

Irrigation



Shading



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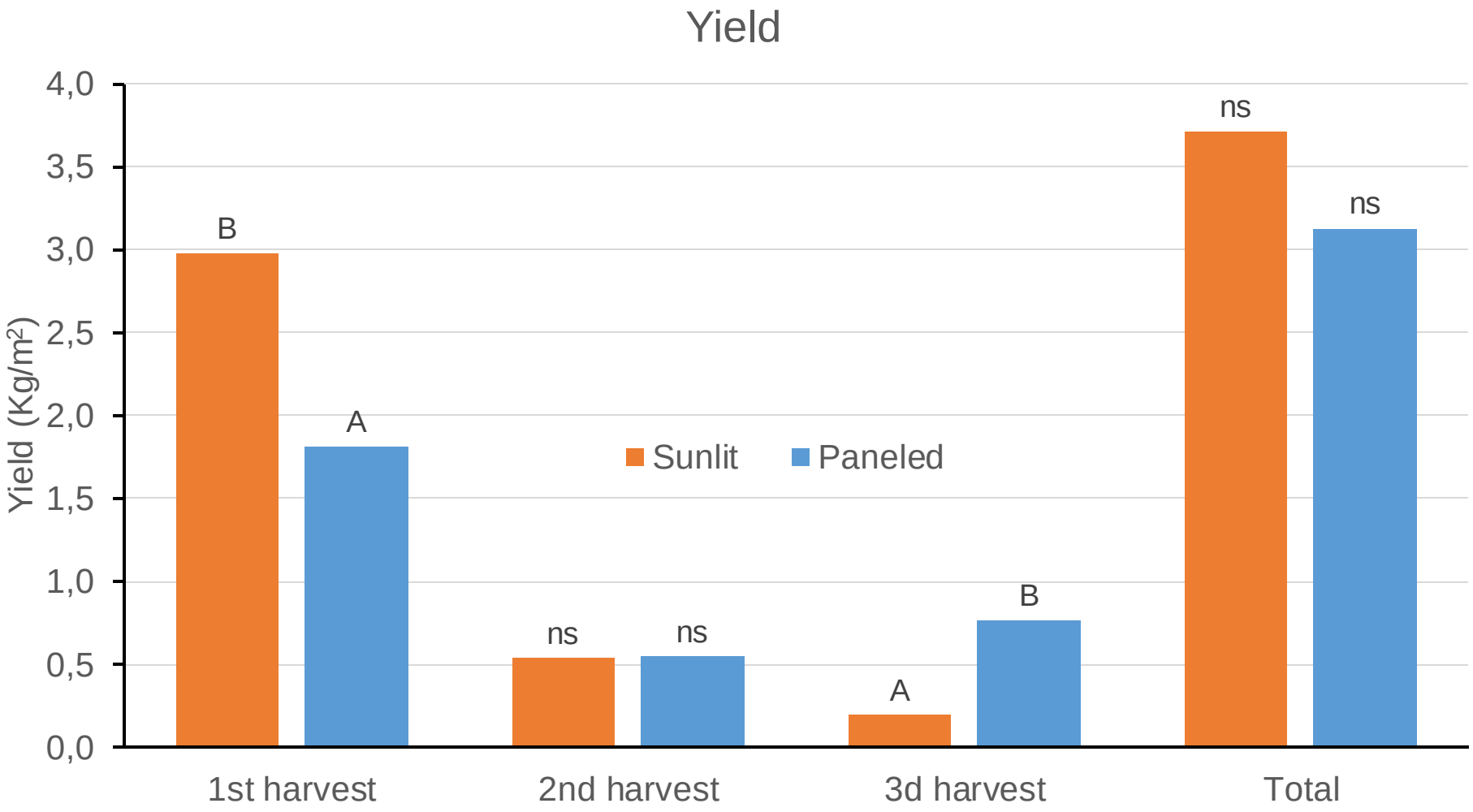
Yields



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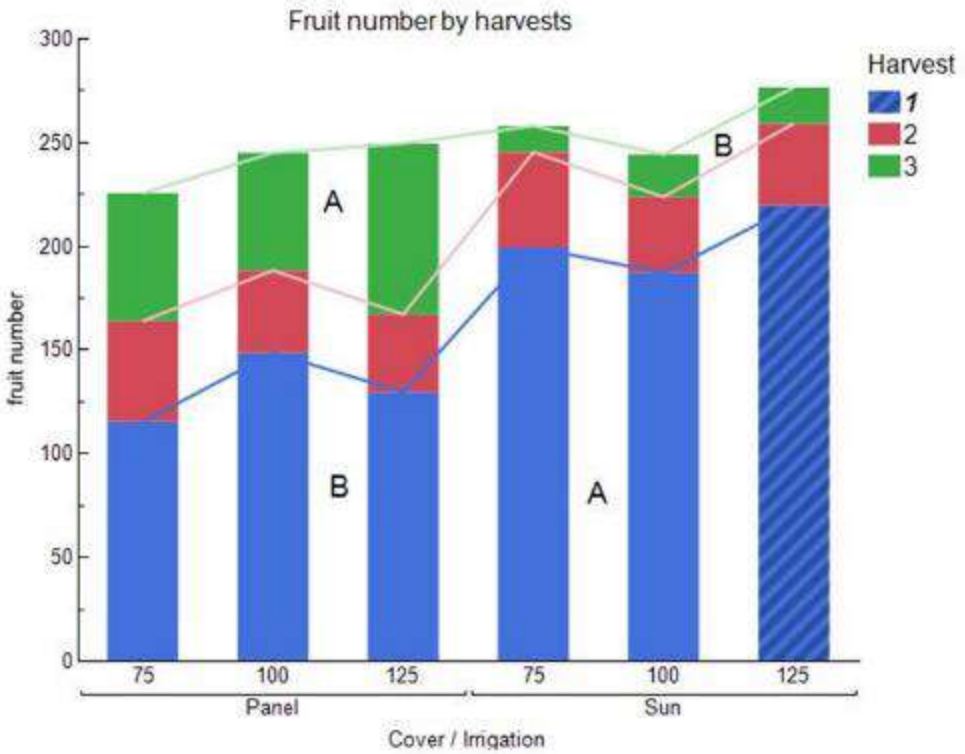
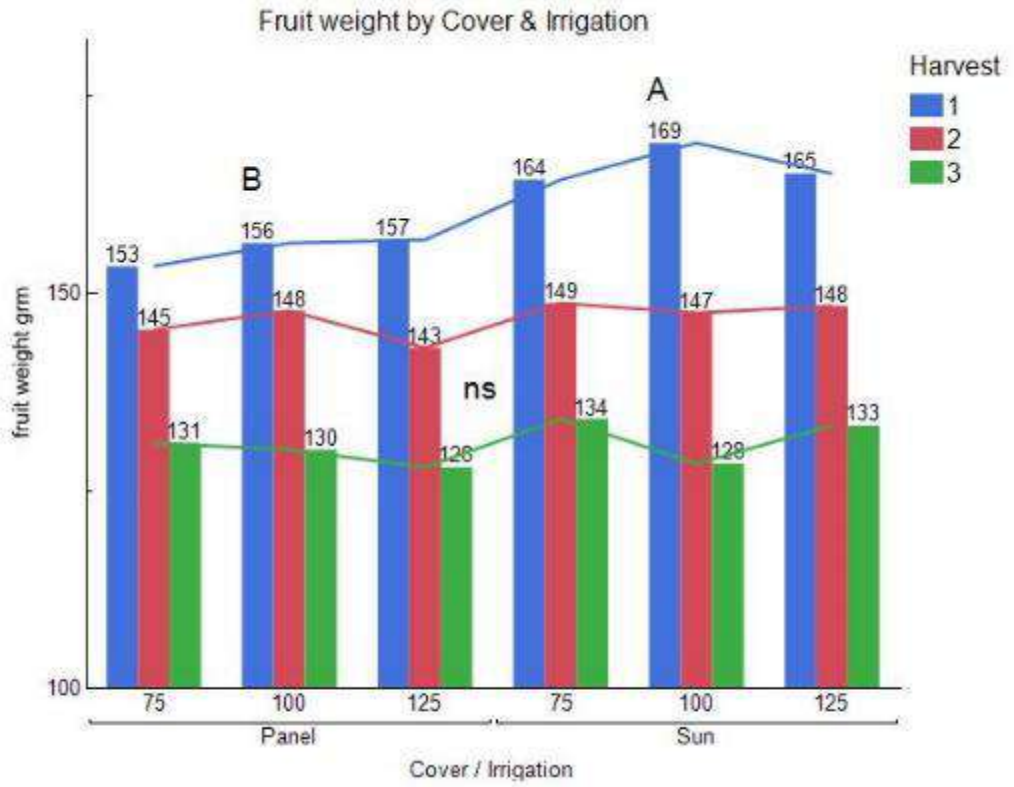
Fruit count and unit weight





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Cooperation and acknowledgments

Ayelet Hashahar 2021, our appreciation for the cooperation:

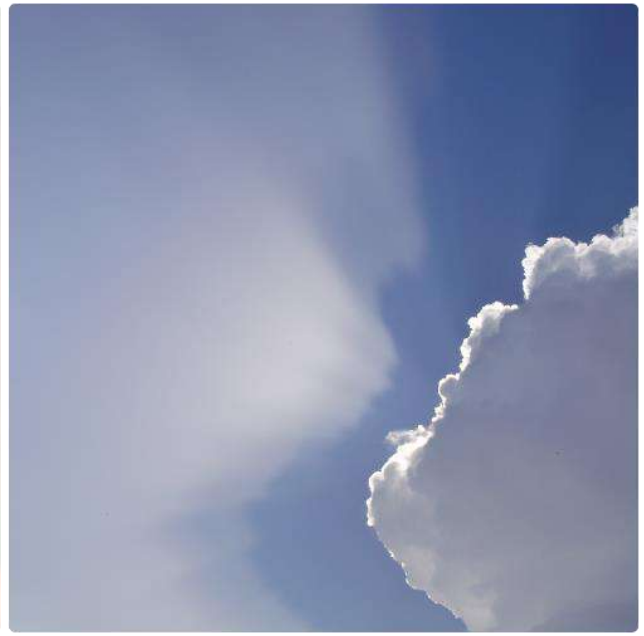
- Eyal Carmi, fruit grower and orchard manager
- Chanani Ladell, agronomist at Doral Group

Yiftah 2022, looking forward for fruitful achievements:

- Agri-Light company of the agri-photovoltaic panels and technology
- Netafim irrigation company
- Yiftah orchards' team
- Northern R&D team at MIGAL

THANKS FOR YOUR ATTENTION!



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