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Estimating Groundwater Recharge in Pecan Fields Under Different Irrigation Systems

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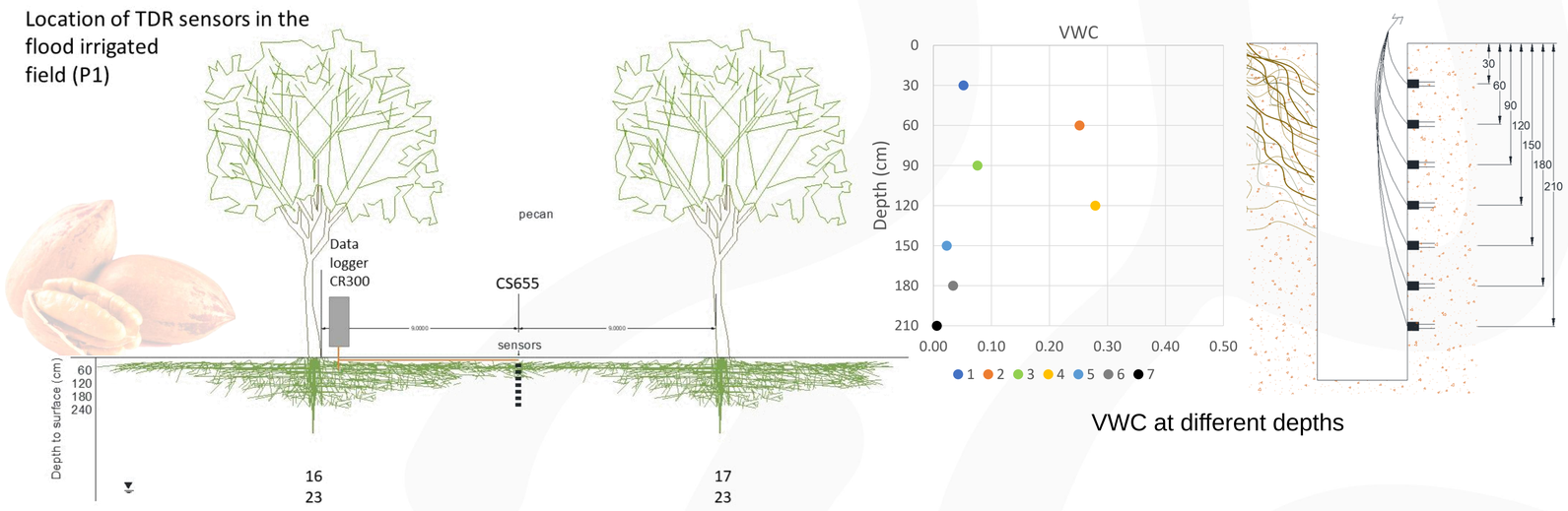
Objectives

1. Estimate deep percolation in drip and flood irrigated pecan orchards to understand better surface water/groundwater interactions for improved river basin water management.
2. Quantify water stored in the soil and lost through evapotranspiration.
3. Monitor the water table to assess groundwater level fluctuations and quantify water consumption.

Methods

One of the study sites is located at Leyendecker Plant Science Center, 14 km south of Las Cruces, New Mexico. The field area is 0.04 km^2, with approximately 460 trees with a square spacing of 9 m. Trees are approximately ten years old, with an average trunk diameter of 0.20 m.

The soil water content is measured at three different locations using time domain reflectometry (TDR) probes (CS655 12 cm. Campbell Scientific) installed at different depth intervals (30, 60, 90, 120, 150, 180, 210 cm). The data are stored in a Campbell Scientific data logger CR300.



VWC at different depths

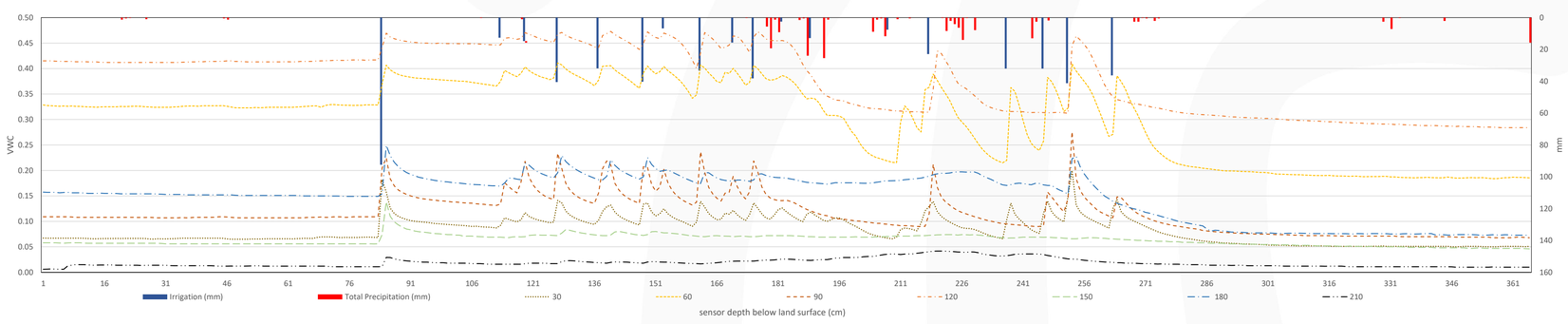
Results

This study uses the commonly used water balance equation to estimate the amount of deep percolation in drip and flood irrigated pecan orchards in the Mesilla Valley.

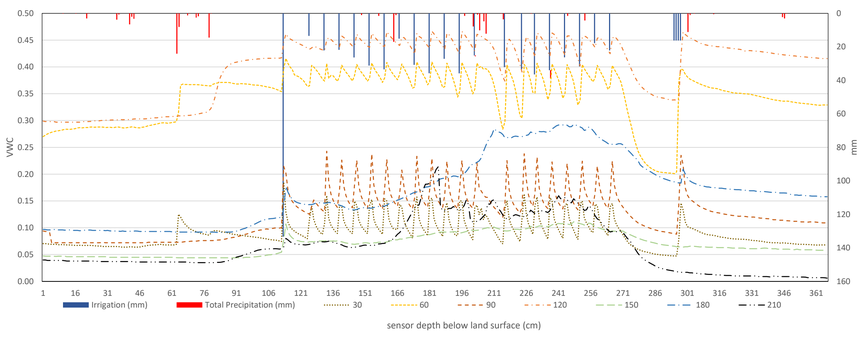
$$DP = IR + R - \Delta S - RO - ET$$

Flow meter (Bigfoot) — Rain gage — CS 655 — Leyendecker weather station

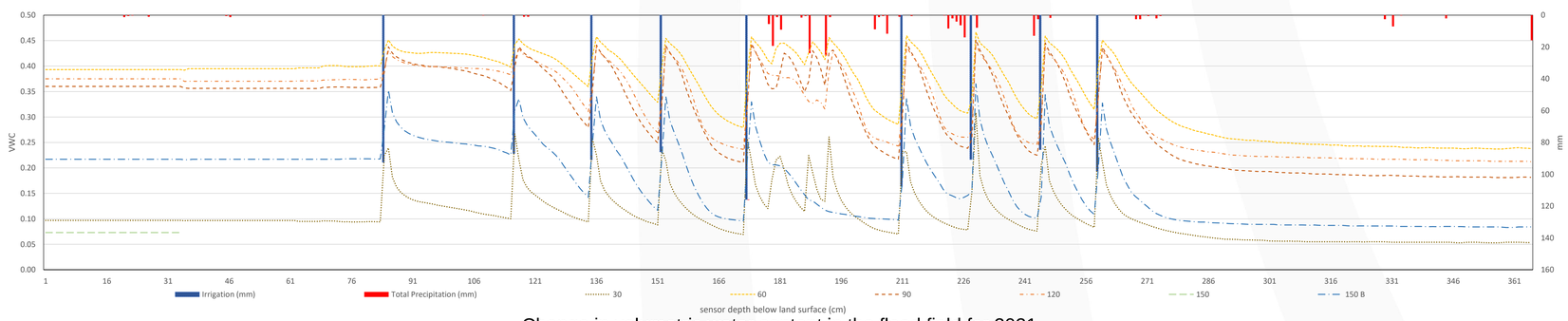
where (DP) deep percolation, (IR) irrigation, (R) precipitation, (ΔS) change in storage, (RO) runoff, (ET) evapotranspiration.



Change in volumetric water content in the drip field for 2021.



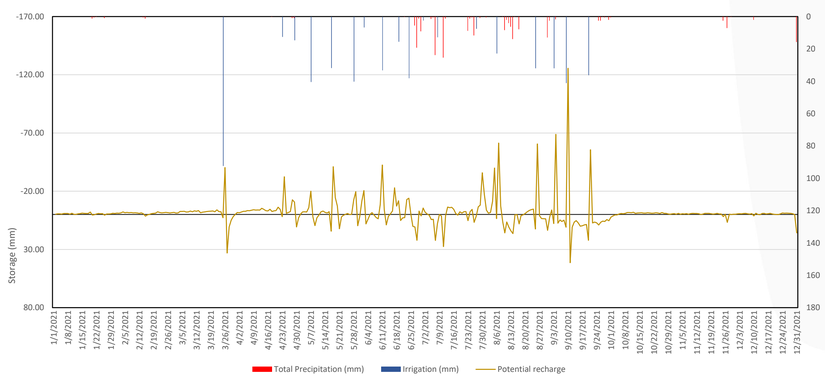
Change in volumetric water content in the drip field for 2020.



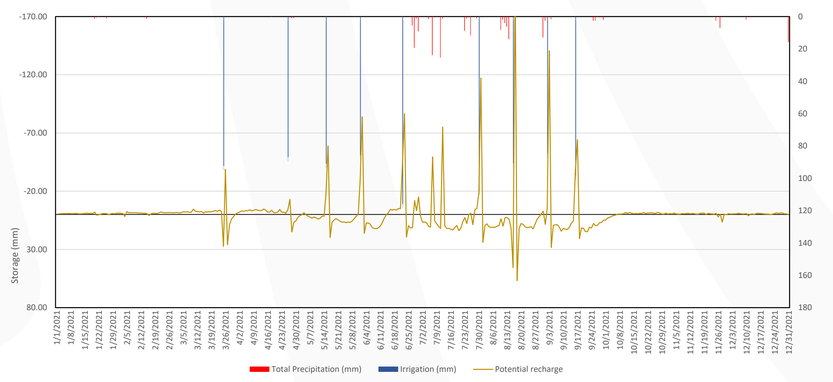
Change in volumetric water content in the flood field for 2021.

Conclusions

Deep percolation in the 2020 growing season was 4% of the total water applied in the drip field with 25 irrigation events; for the flooded field, there was 12% of the total water applied that became deep percolation with only 9 irrigations. The sensor installed at 210 cm shows that there may be also some capillary rise in the field that may affect the water movement down in the field.



Estimated recharge and water lost through evapotranspiration in the drip field for 2021.



Estimated recharge and water lost through evapotranspiration in the flood field for 2021.

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