Date palm sap flow: Estimation of water demands in three varieties under different salinity and irrigation levels

in collaboration with Enviroment Agency - Abu Dhabi

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Objectives

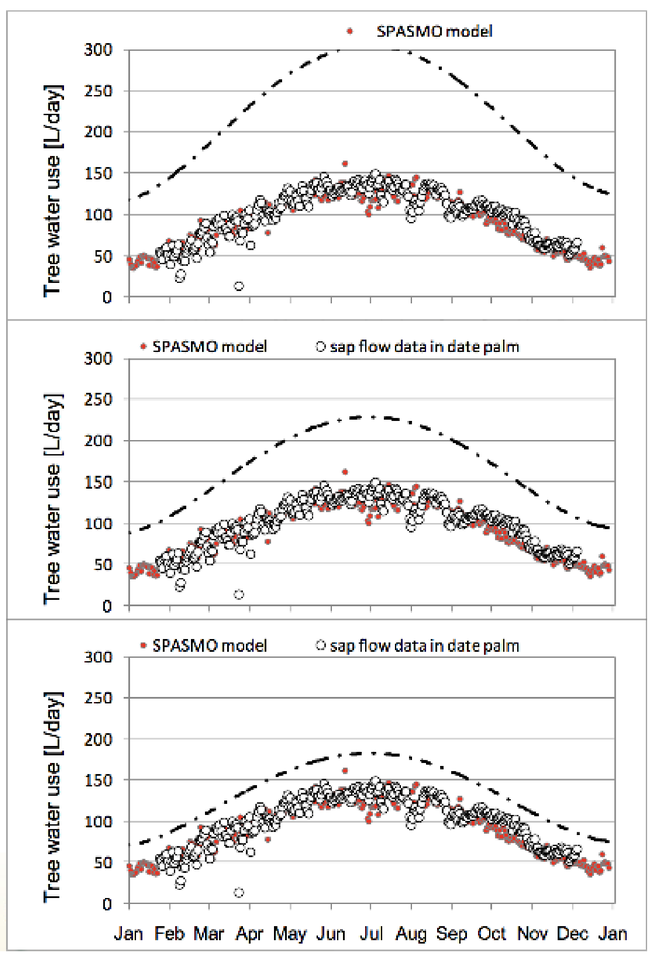
- To investigate ways to improve irrigation management and optimize water usage.
- To investigate the impact of different levels of water salinity and irrigation on tree water use, irrigation need and date production.
- To investigate how different varieties of date palm respond to altered irrigation volumes and salinity levels.
- To develop a date palm plantation management tool (i.e. customized software to assess the impacts of irrigation and salinity management).

Material & Methods

- Three date Palm varieties: Lulu, Khalas and Shahla
- Salinity level: 5, 10 and 15 dS/m
- Irrigation levels: Apply daily replacement volumes equal to ET0, ETO + 50%; ETO + 100%; and common irrigation practiced by farmers.
- Sap flow (transpiration): 4 probes, each measuring at depths within the trunk of each of 3 palms
- Soil water content measured to 1.2 m depth within, outside, and between the basins, using TDR technology
- The system is fully automated (salinity level, irrigation quantities and soil and weather measurements) and controlled by SCADA computerized system

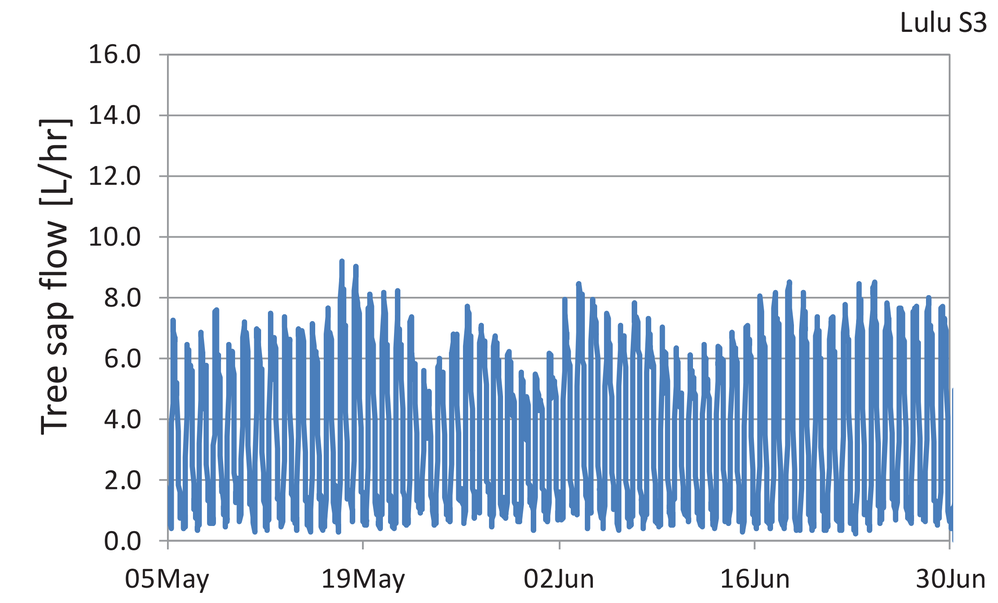
Optimizing Date Palm Irrigation-Early Results

Difference between actual water use by Lulu tree and amount of water applied is higher at the traditional irrigation practices (upper graph) and lower at ETc based irrigation (lower graph)



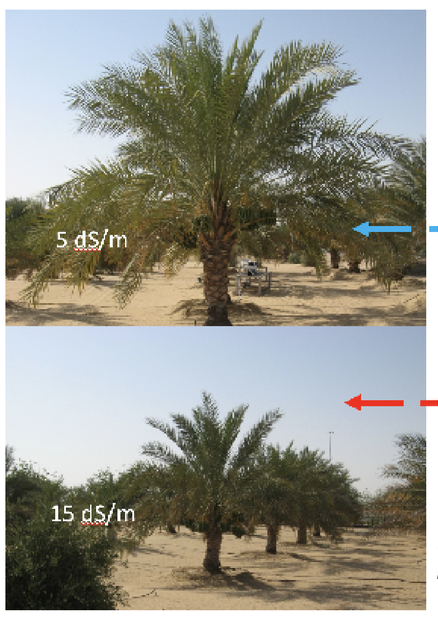
Ahmed Al Muaini has enrolled at Massey University and this is part of his PhD project.

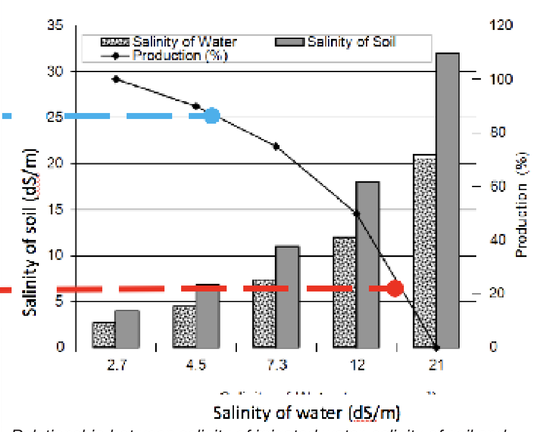
Early Results on the Impact of Salinity: Daily Water Use



At high salinity the tree use less water due to stress

Date Palms are Sensitive to Salinity





Relationship between salinity of irrigated water, salinity of soil and production of date palm trees (Zaid and Liebenberg 2005)

- The impact of salinity is being monitored through:

1. Tree water use at each salinity level
2. Date palm fruit production & quality
3. Growth parameters and tree leaf area

Findings and where to next?

What have the current experiments have achieved:

- Use of sap flow to deduce a 'crop factor 'that relates tree water use to the prevailing climate (as determined by Eto)
- Use of crop factor to produce seasonal schedule of tree water use
- Use of flow meters to monitor irrigation volumes
- Use of TDR to assess irrigation efficiency

Main findings of the study and implications for further work:

- Lulu trees are currently being overwatered by a factor of 2.5
- Can we reduce irrigation volumes and maintain tree production