

Contribution of saline groundwater table to date palm water use in oases area

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Background

In arid regions, water resources are extremely limited. The contribution of groundwater table to supply crop water requirement can be very important in these areas. Studies in California and Texas have shown that salt tolerant crops are able to extract significant quantities of water from saline water table (Ayars and shoneman 1986). According to Grismer and Gates 1988, under arid conditions, water table can supply as much as 60 to 70% of crop's water requirement.

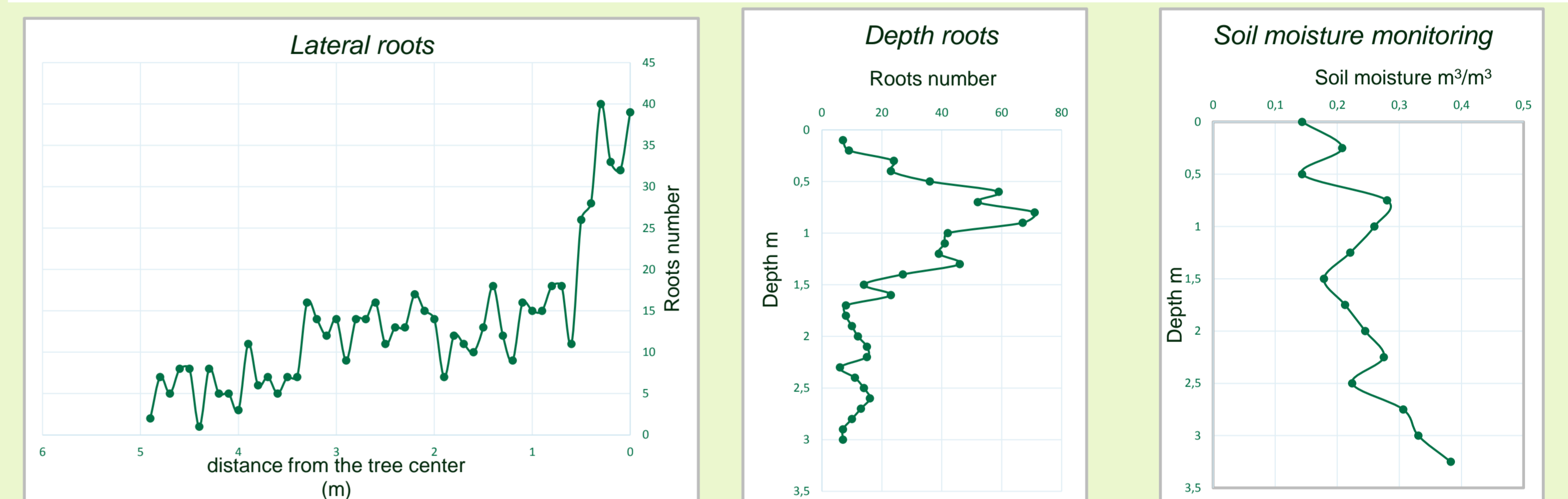
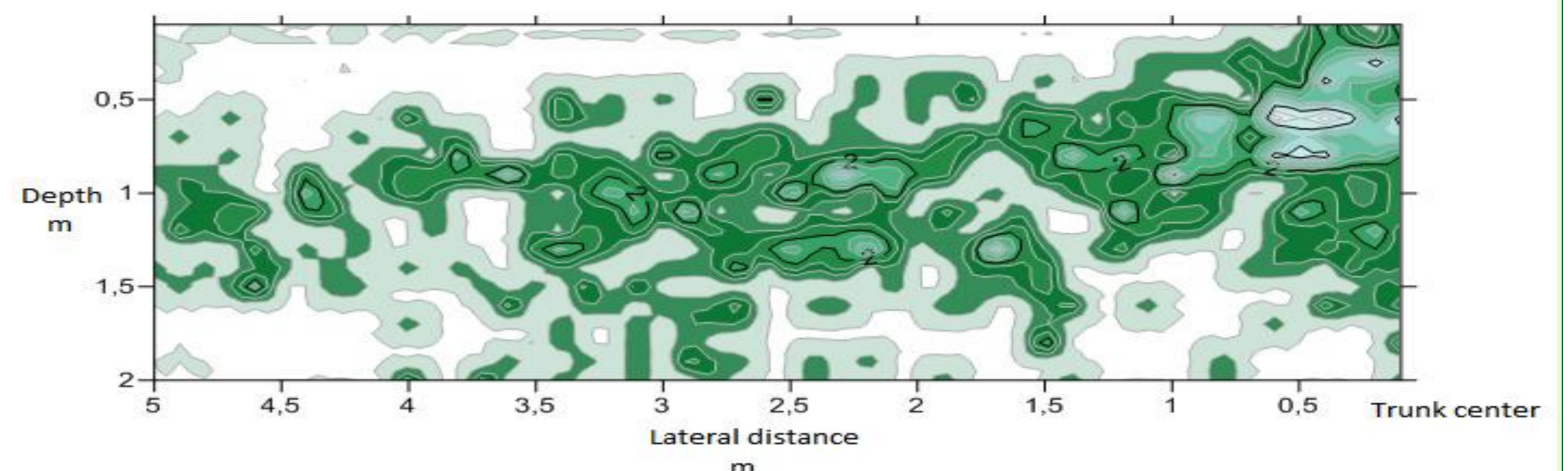
The contribution of shallow water table to crops water requirement varied with crops species, root zone environment, soil characteristics, salinity and water table depth (Sepaskhah, 2002 et Zhao, 2005). For the date palm trees, the results obtained by Benaissa (2009) in the oasis of Fetnassa showed good correlation between date palm evapotranspiration and nycthemeral dynamics of the shallow aquifer. In 2010, results reported by Zeineldin et al. confirm that the contribution of saline water table to date palm water use can vary from 17% to 50% depending on the water table depth and climatic demand.

Understanding the interaction between groundwater table and plant development is fundamental to improve water use efficiency. Little attention has been paid to this topic especially for the Moroccan context. This study aims to:

- 1) Follow up the effect of shallow water table on date palm root development
- 2) Determine the contribution of groundwater table to date palm water consumption in oasis areas of Morocco.

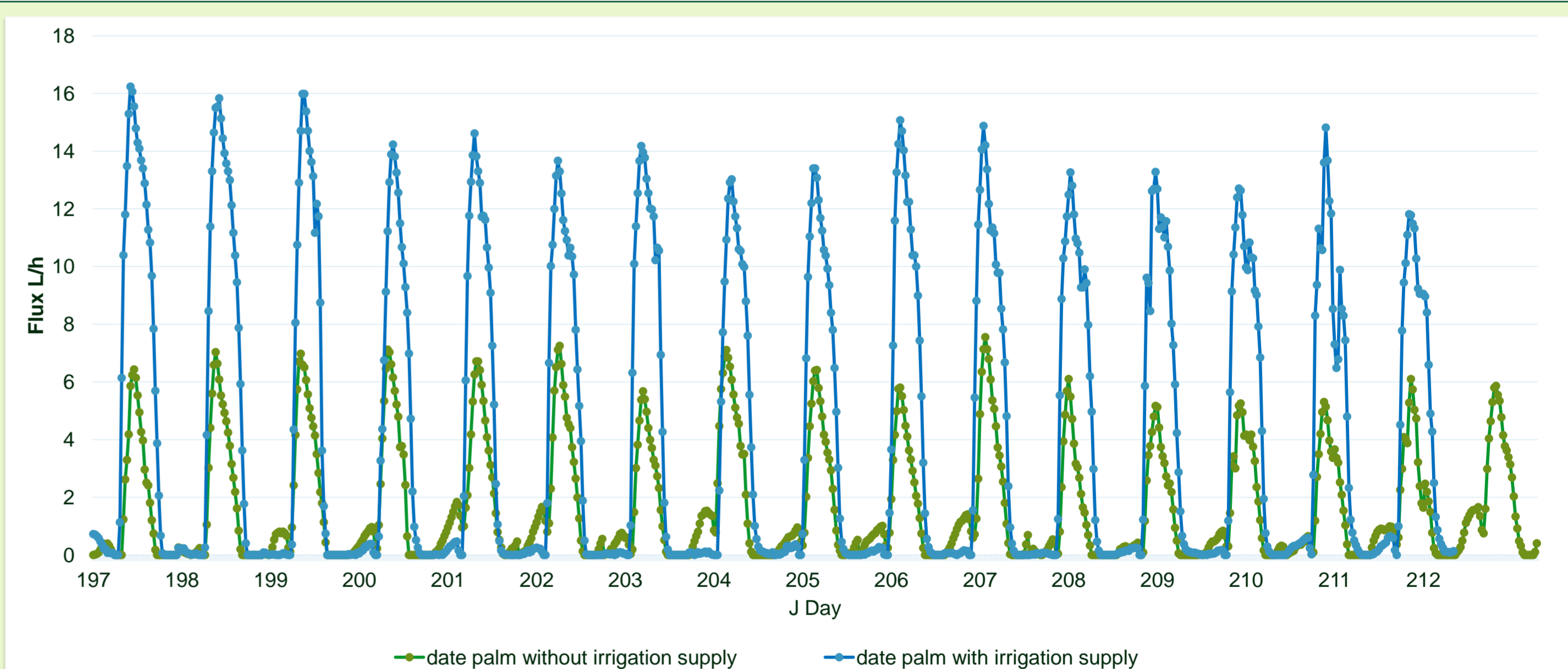
Results

Mapping date palm roots system in presence of shallow groundwater table



Roots are found as far as 5 m from the palm tree and deeper than 3 m. 80 % of the roots are distributed in the zone of 2 m deep and 3 m on lateral side. It is worth mentioning that date palm roots development correlate perfectly with the soil moisture profile realized. High root density horizons corresponds to high humidity horizon. The results have also revealed that the root system of date palm trees can reach very important depth (up to 9m) to withdraw the water from phreatic table. The results have shown that during the dry season (june, july and august), and without irrigation supply, 50% of date palm transpiration are satisfied by groundwater table.

Date palm transpiration with and without irrigation supply



Conclusion

Soil properties such as retention and transmission, global demand, the distribution of the root system the depth and the salinity of the water table are very important factors to consider in order to understand the interaction between the groundwater table and the date palm trees. Crops can respond in different ways depending on the variation of soil type, climate and the characteristics of the water table. Therefore, the determination of palm tree water requirement has to take into account the fraction of root water uptake directly withdraw from shallow water table.

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Acknowledgements

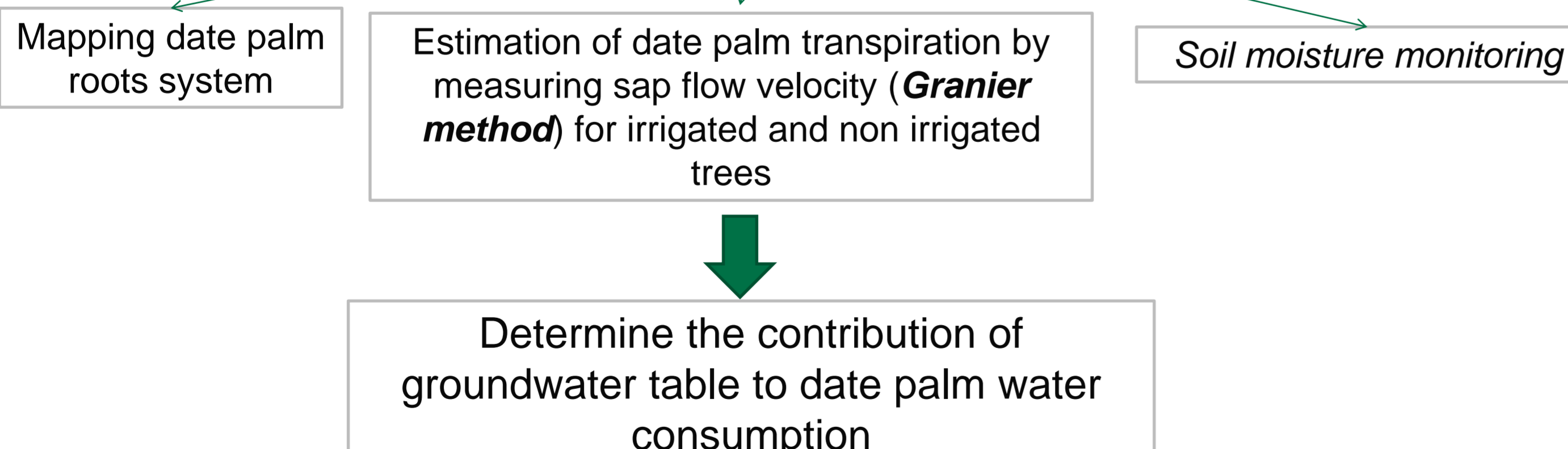
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(a)(b) Characterisation of roots profil (c) Transpiration measurement (d) Soil moisture monitoring



Methods

Experimental approach



Site characteristics

- Location: Tafilalet oasis, South-Eastern Morocco.
- Adult date palm in monoculture (7x7); Mejhoul variety.
- Water table depth: fluctuates between 4 and 5m.
- Salinity: average salinity of 5 g/l.
- Soil: sandy loam.
- Irrigation system: surface drip irrigation.