

# Irrigation and Drainage Engineering

(Soil Water Regime Management)

(ENV-549)

4ETCS, Master option

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Platform of Hydraulic Constructions

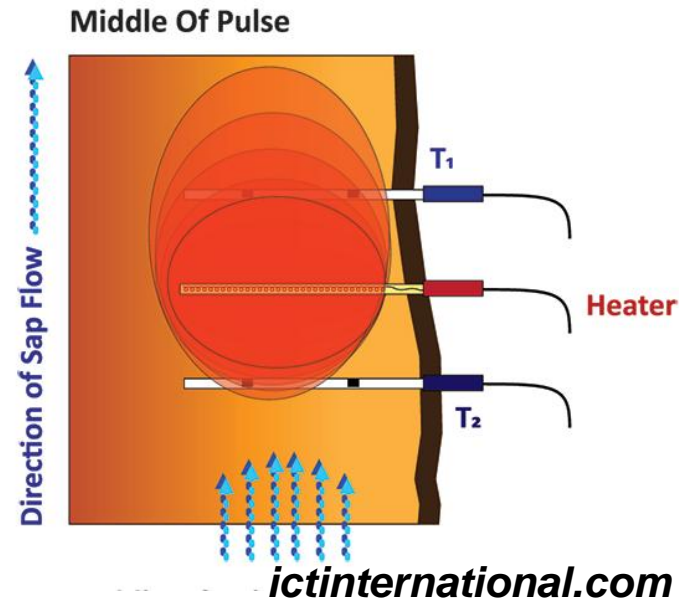


Project: flooding in  
Nouakchott (Mauritania) –  
Sapflow measurements

# In-situ transpiration measurement

Sap flow meters

- Measurement of the sap velocity
- Directly proportional to the water flux in the tronc
- Water flux in tronc = transpiration



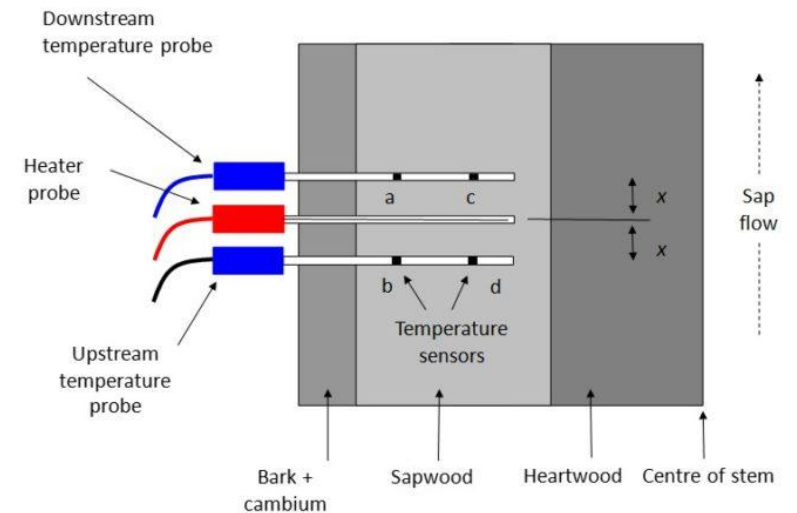
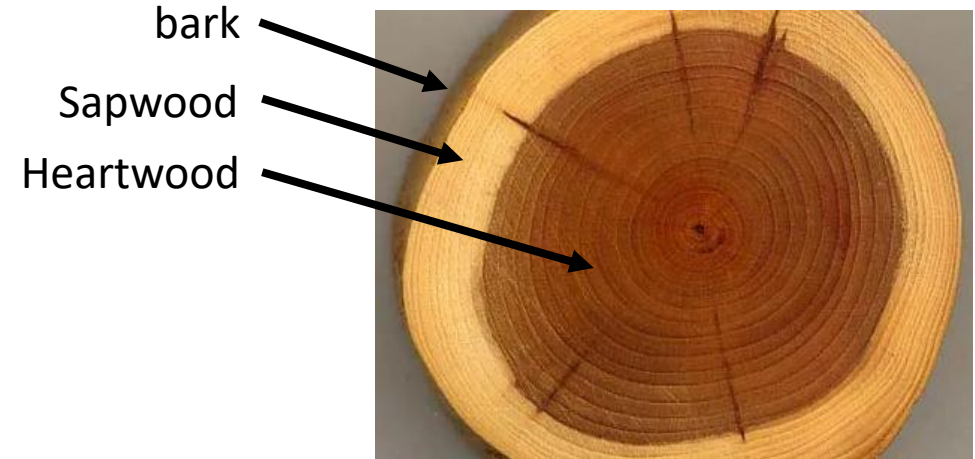
# In-situ transpiration measurement

- In **dicot trees** = sap mainly flows in the sapwood
  - ➔ Sap flow meters directly set on the trunk
  - ➔ Tree transpiration = sap velocity x sapwood area

➔ Allometric function to estimate sapwood area as a function of the trunk diameter at breast height (DBH)

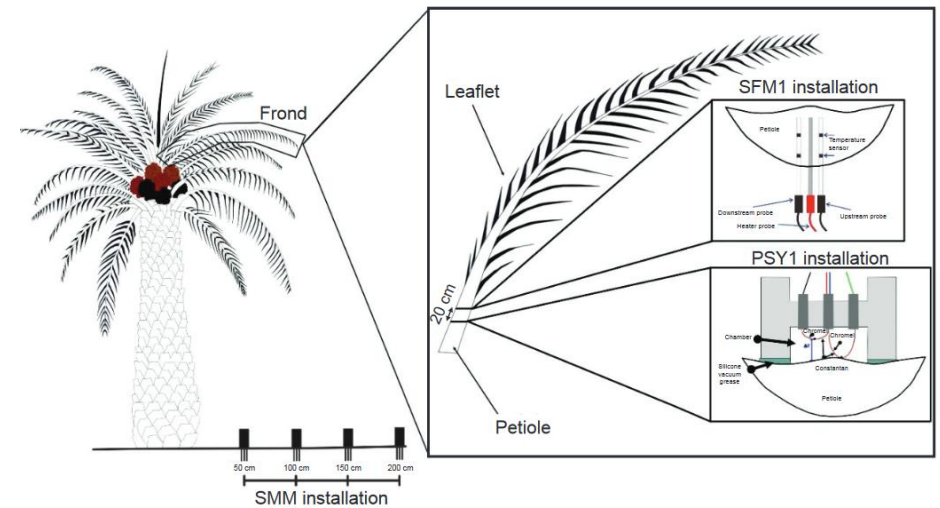
$$A_s = 0.728 \times DBH^{1.998}$$

With  
 $A_s$  the sapwood area



# In-situ transpiration measurement

- For **monocot trees** (*Phoenix dactylifera*) = sap mainly flows in the center of the trunk ⇔ not accessible with the sap flow meters
- ➔ Sapflow meters set on the basis of the fronds/leafblades (the entire section of the frond conducts sap)
- ➔ Tree transpiration = transpiration of a frond x number of fronds on the tree



# Pumping and groundwater drawdown

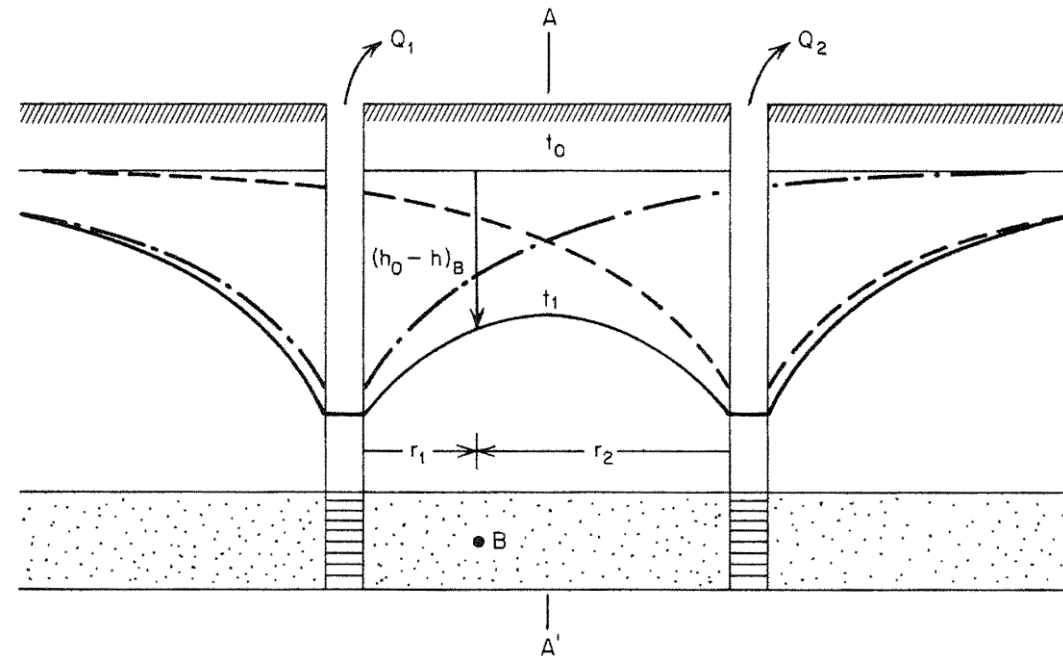
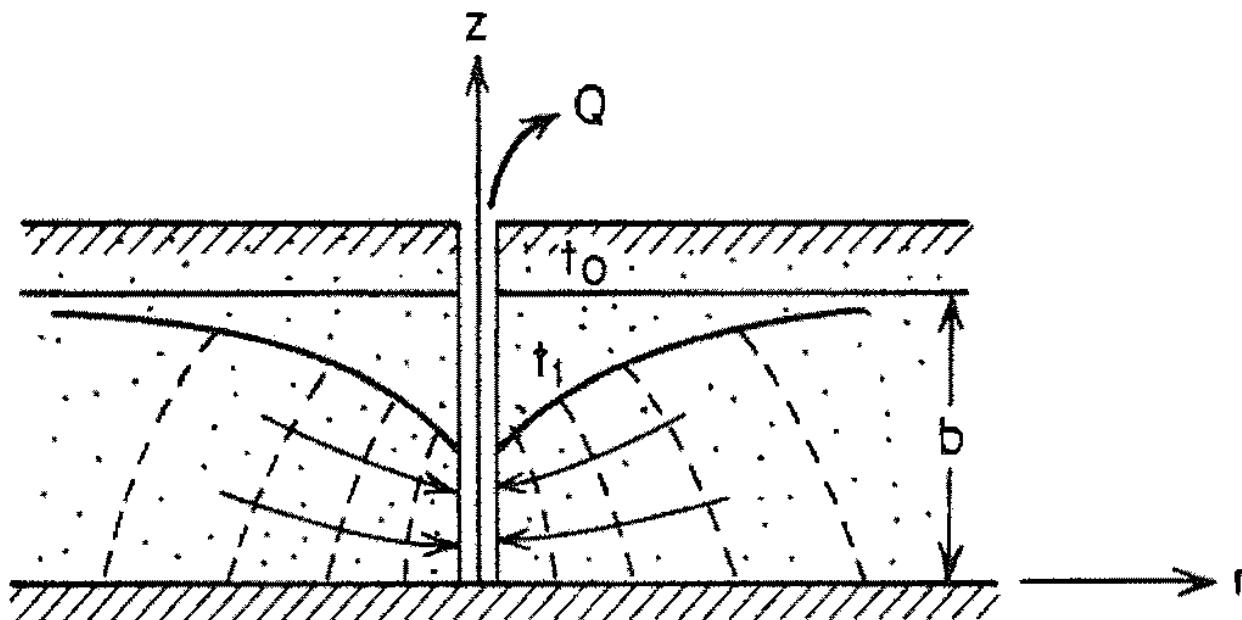
- Impact of pumping on the groundwater levels = drawdown (s)

$$s = h_0 - h_1$$

With

$h_0$  the hydraulic head before pumping

$h_1$  the hydraulic head at  $t_1$  (during pumping)



--- Drawdown due to  $Q_2$     -·-·- Drawdown due to  $Q_1$     — Total drawdown

Freeze, R. A., & Cherry, J. A. (1979). *Groundwater*. Prentice-Hall.

<https://gw-project.org/books/groundwater/>