

# Ecohydrology of CAM plants: environmental co-benefits for agroecosystems



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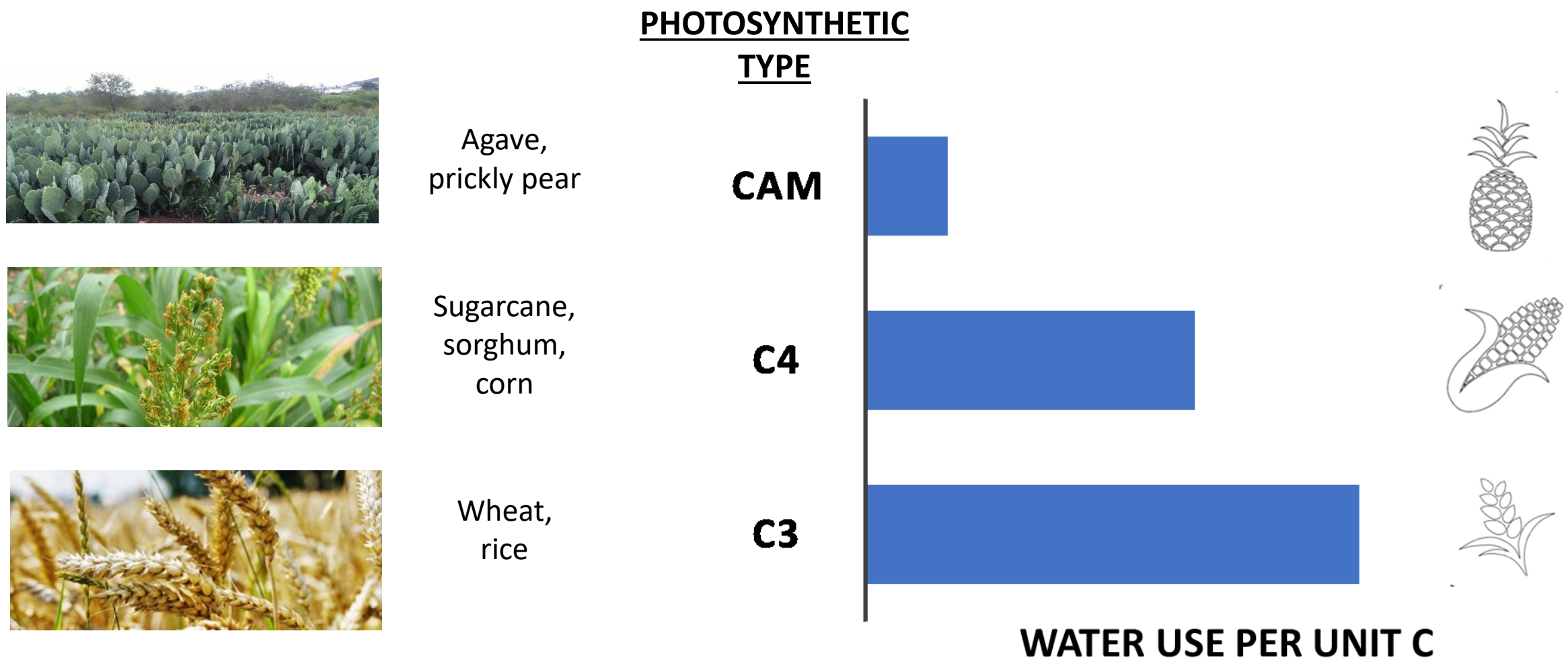
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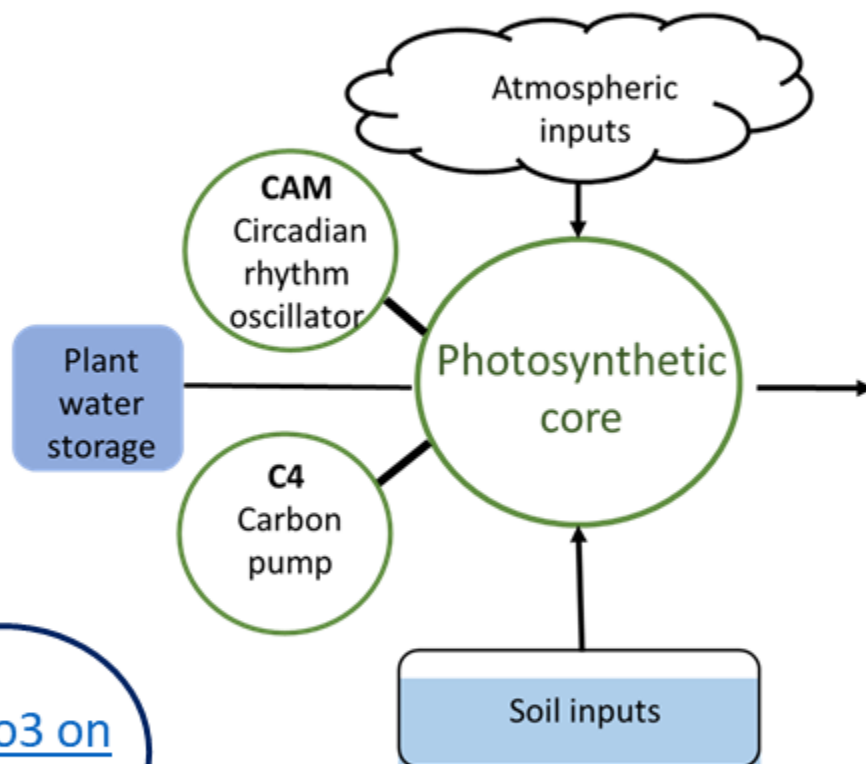
# Photosynthesis and water use efficiency



For an analogy and description of the pathways, see Hartzell et al. (2018) PLOS ONE 13(6), [e0198044](https://doi.org/10.1371/journal.pone.0198044).

# Modeling the impact of water stress on C3, C4, and CAM

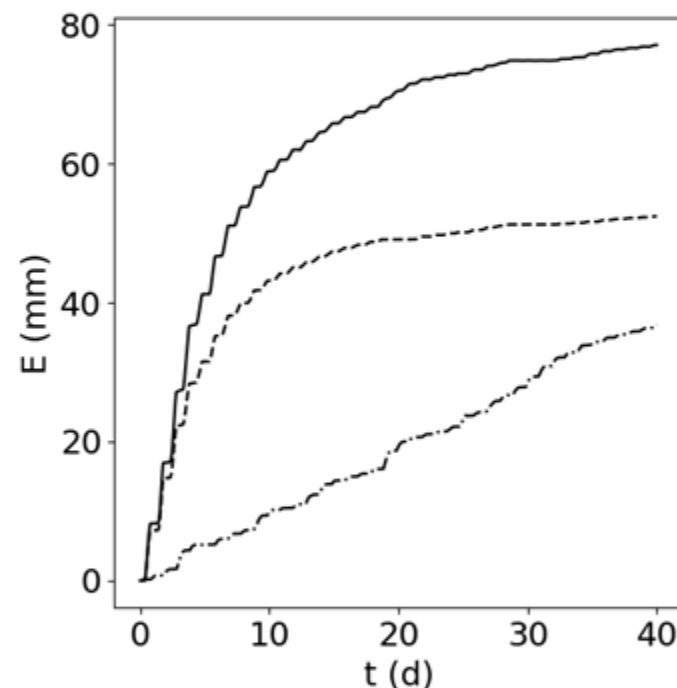
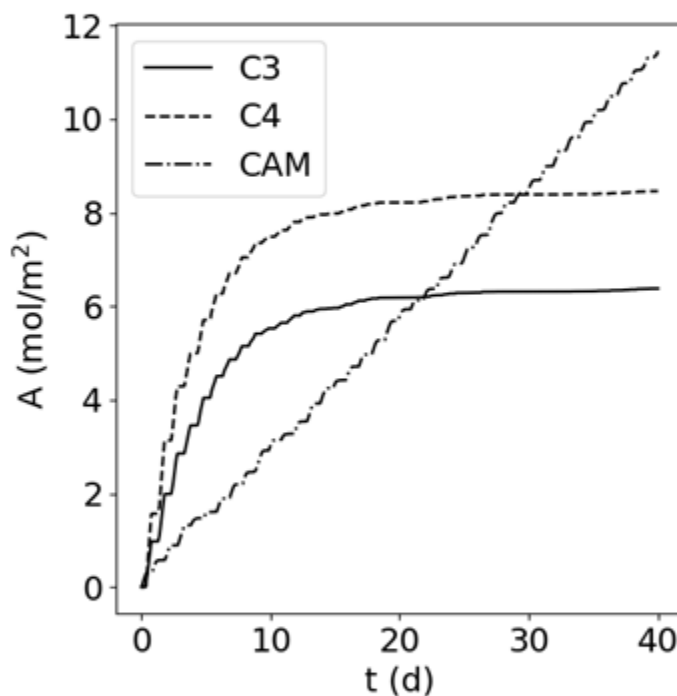
## Photo3 model



[Photo3 on github](#)

Hartzell et al. (2018) *Ecological Modelling*, 384,  
[10.1016/j.ecolmodel.2018.06.012](https://doi.org/10.1016/j.ecolmodel.2018.06.012).

## Comparing C3, C4, and CAM in drydown



$$A_c = A_{\phi, c_m, T_l}(\phi, c_m, T_l) \times f_{\psi_l}(\psi_l)$$

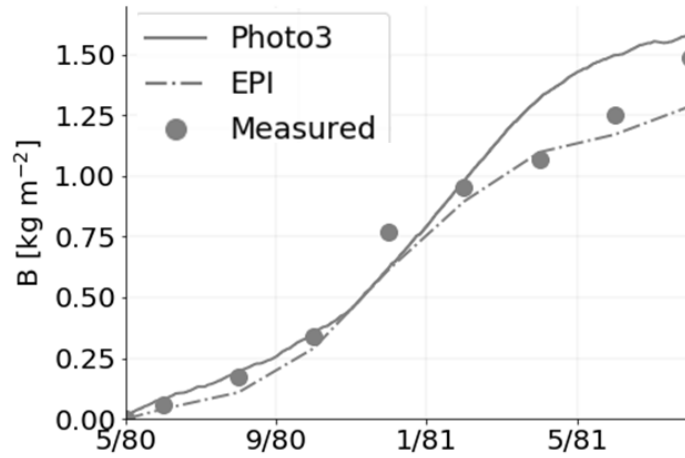
Calvin cycle  
carbon demand

Farquhar model

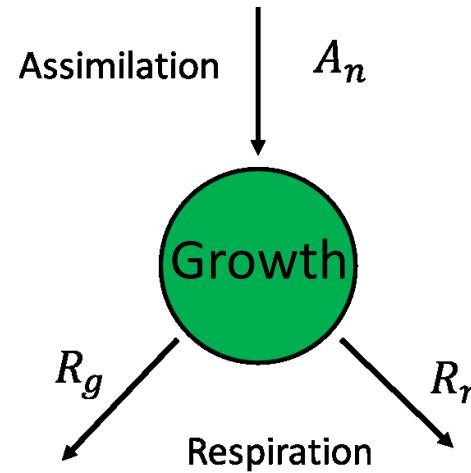
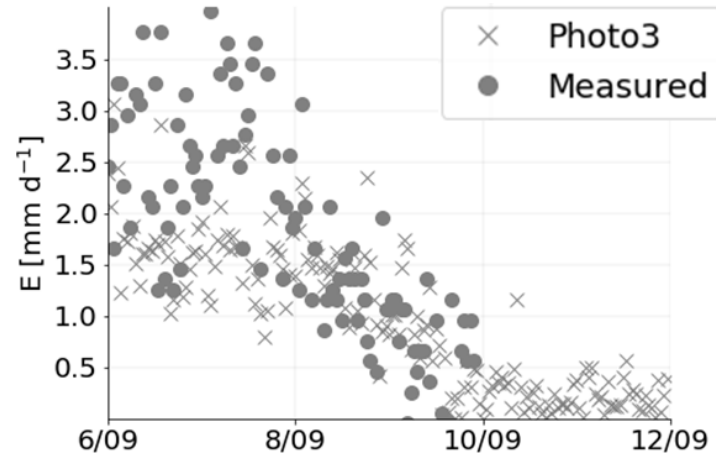
Water stress  
function

# CAM productivity and water use in the field

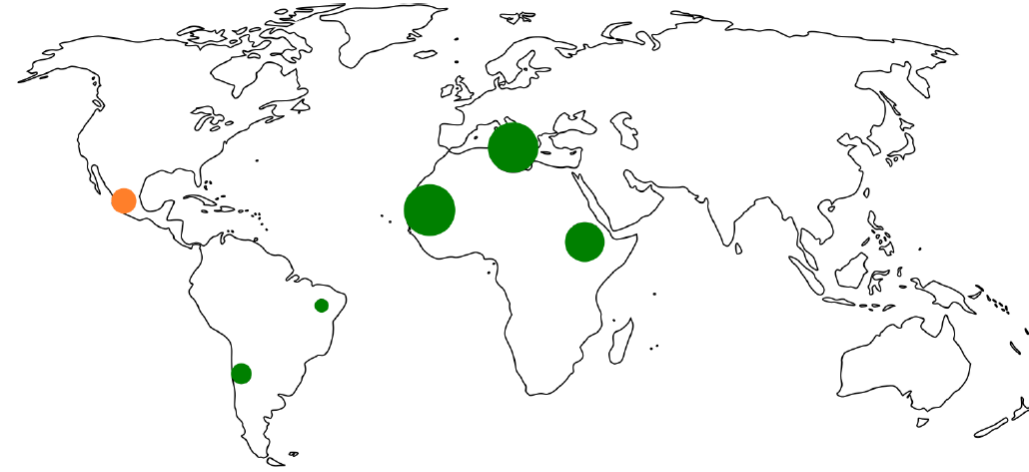
Productivity  
(Til Til, Chile)



Transpiration  
(Sicily, Italy)



$$\frac{dB}{dt} = A_n - R_r - R_g$$



Productivity: discrepancy between Photo3 and EPI models



*O. ficus-indica*



# Environmental co-benefits for agroecosystems

CAM crops perform consistently. Under low annual rainfall and/or high hydroclimatic variability they can...

- increase agricultural productivity and provide social benefits
- benefit soil nutrient levels and erosion control
- provide carbon sequestration in soils and biomass which surpasses that of traditional methods

