

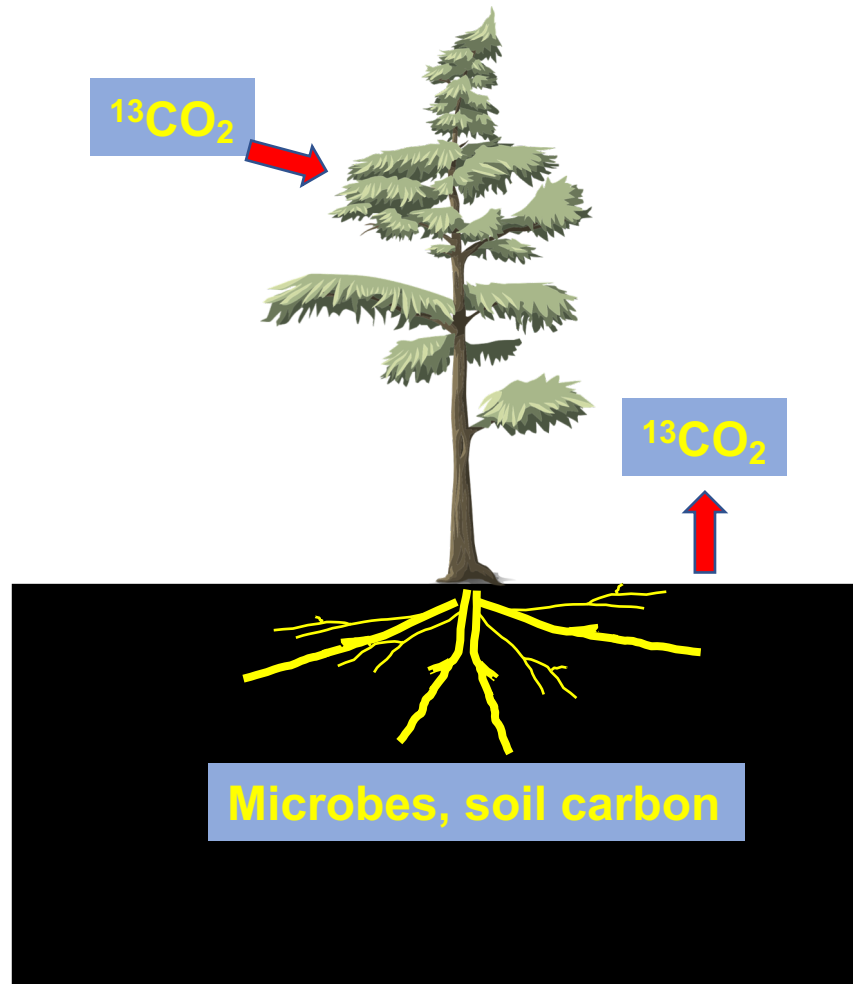


*News from the dark side*

# *Tracking the Carbon footprint of trees in the soil*

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Pulse-labelling team

# Carbon footprint in soils is of fundamental importance



- Drought regime affects C allocation
- impacts C-inputs into soils  
C-supply of microbes, soil C storage
- influences sink activity in soils
- impacts C balance of trees

# From canopy to soil: $^{13}\text{C}$ pulse labelling



Collaboration with  
R. Werner, A. Gessler, J. Jobin, J. Luster, G.  
Gleixner, M. Saurer, H. Hartmann, C. Poll  
....

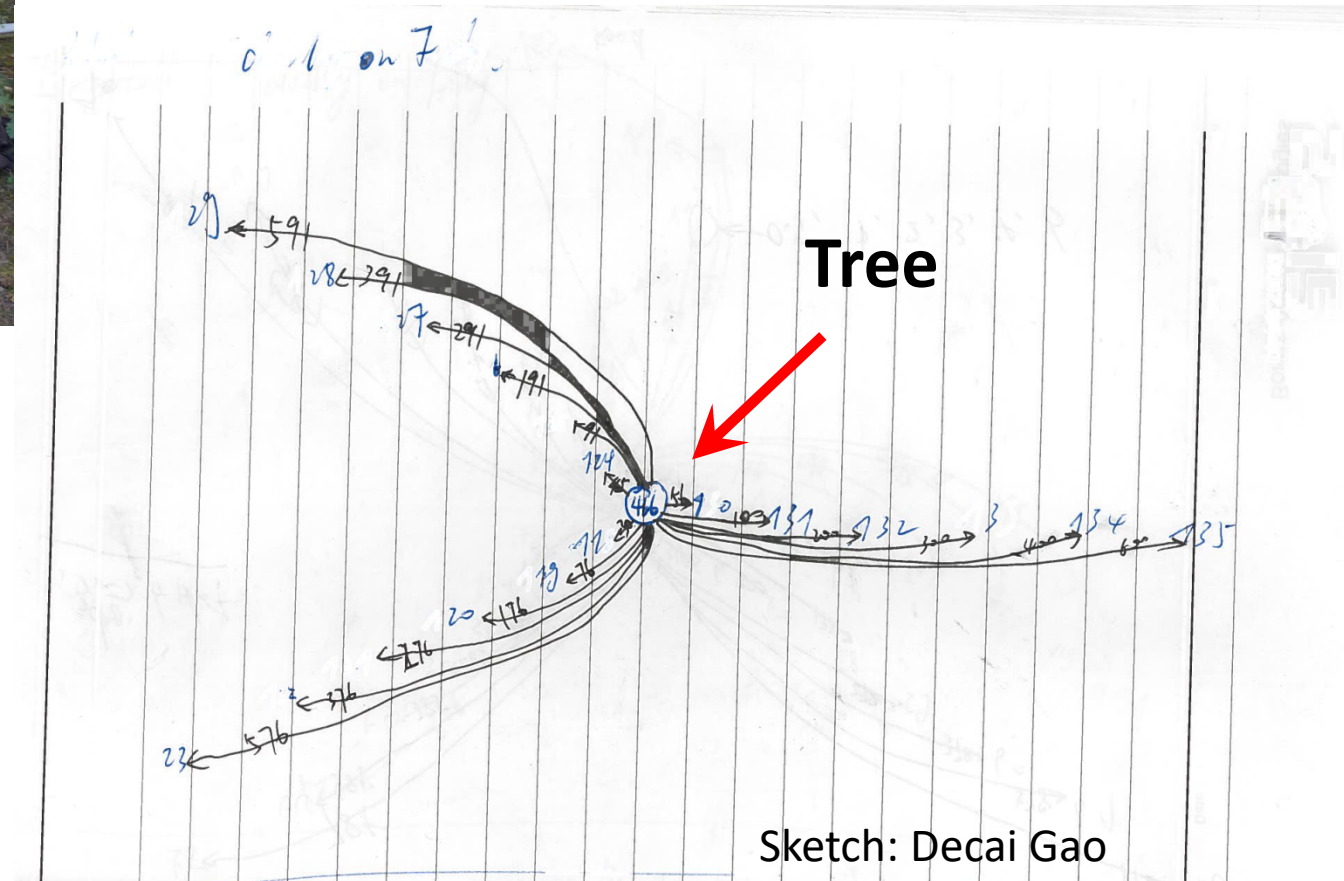


**3.5h  $^{13}\text{C}$ -labelling in blocks**

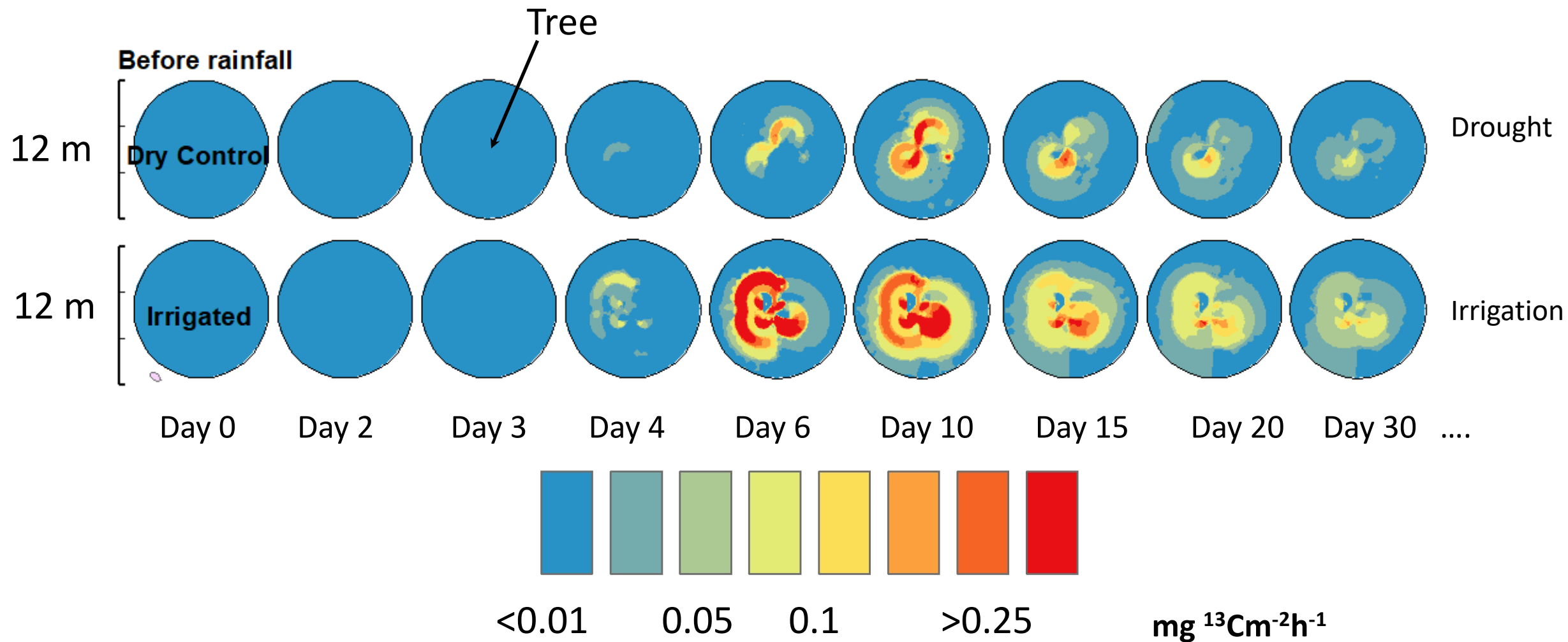
**5 trees under moderate  
drought**

**5 trees irrigated**

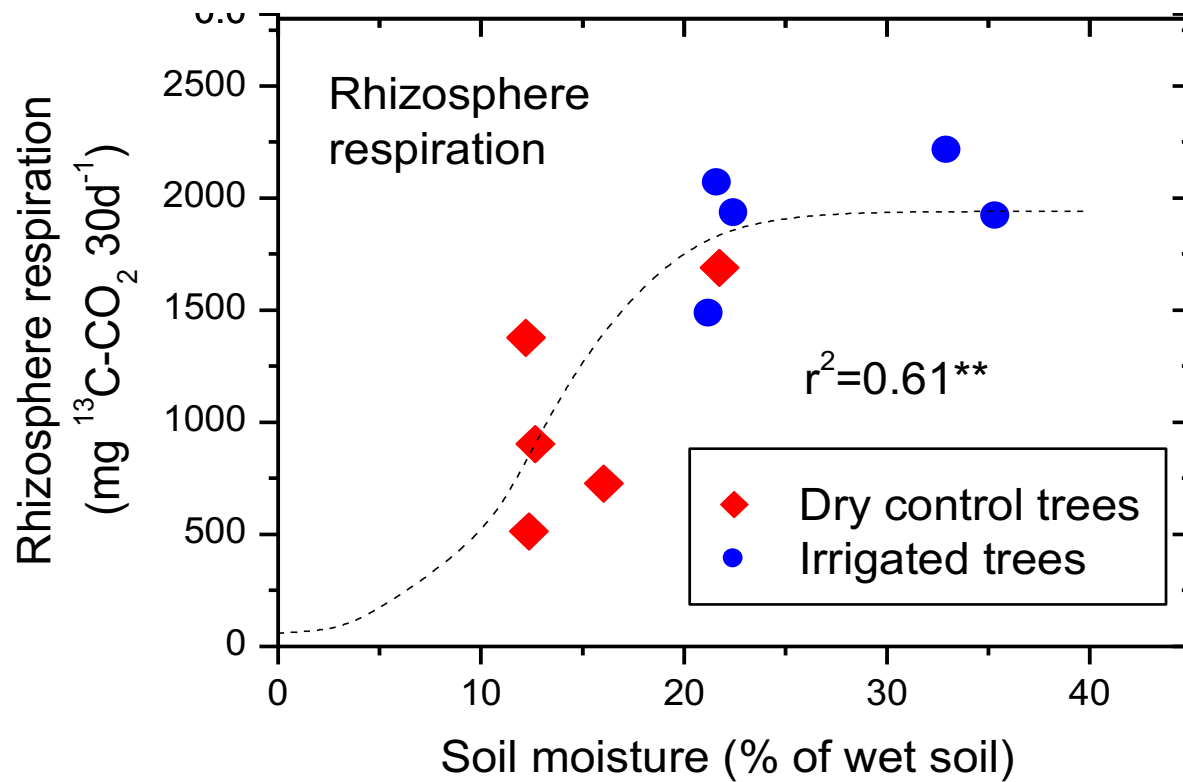
# Spatio-temporal $^{13}\text{C}$ tracing in a mature forest



# Mapping soil-respired $^{13}\text{C}$ (=rhizosphere activity)



# Soil moisture drives rhizosphere activity and belowground C allocation



<sup>13</sup>C pulse-labelling in 3 blocks before and 2 blocks after precipitation

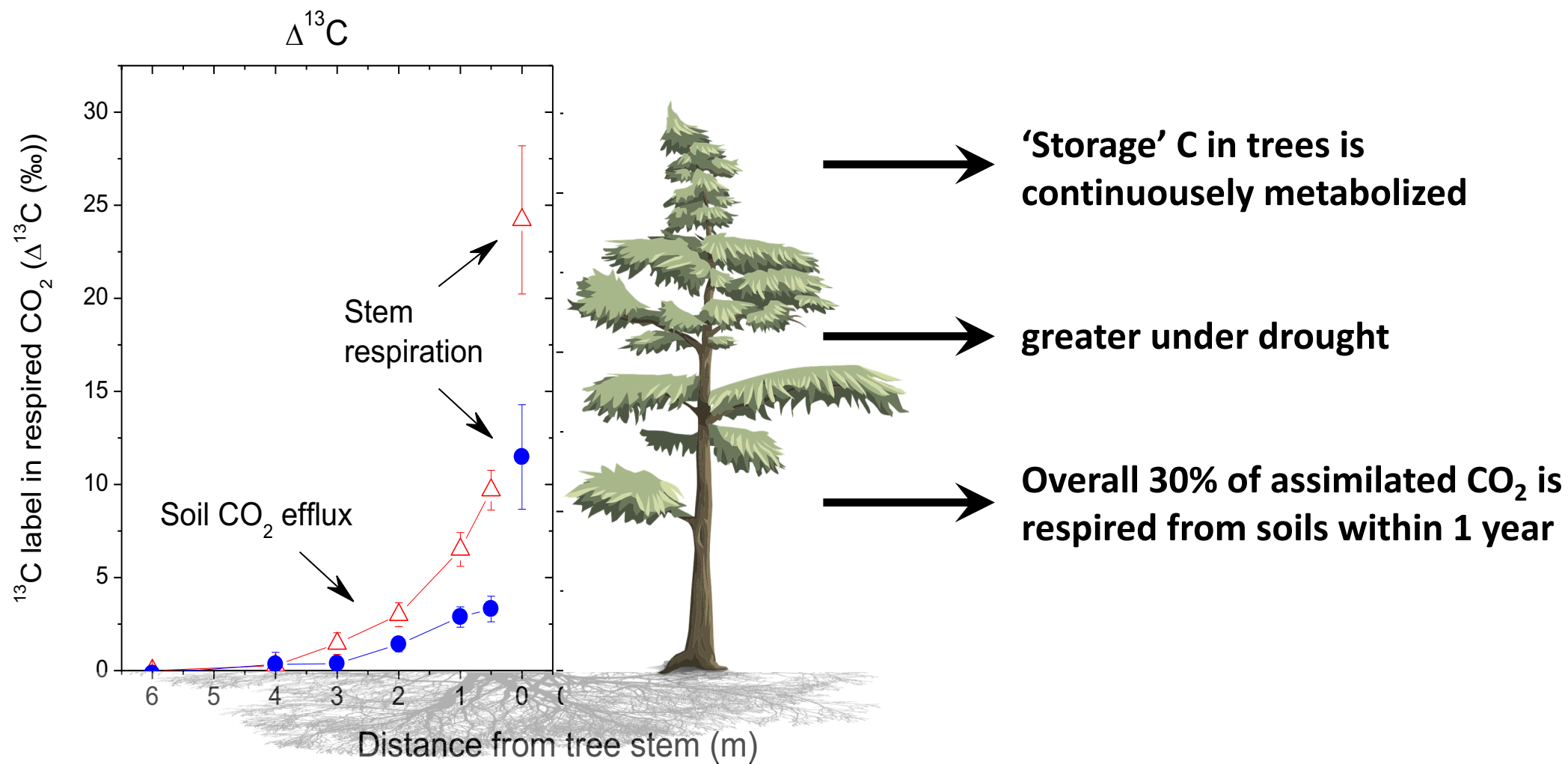
Irrigation effect:

<sup>13</sup>C assimilation by trees: + 17% (n.s.)

Rhizosphere <sup>13</sup>C respiration: + 240%

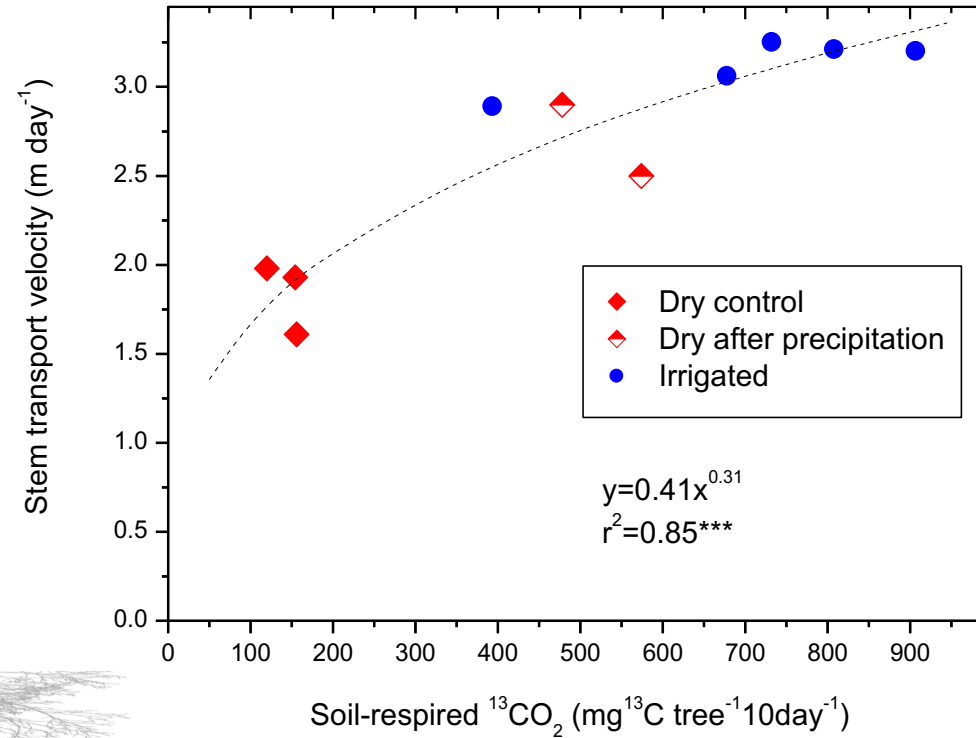
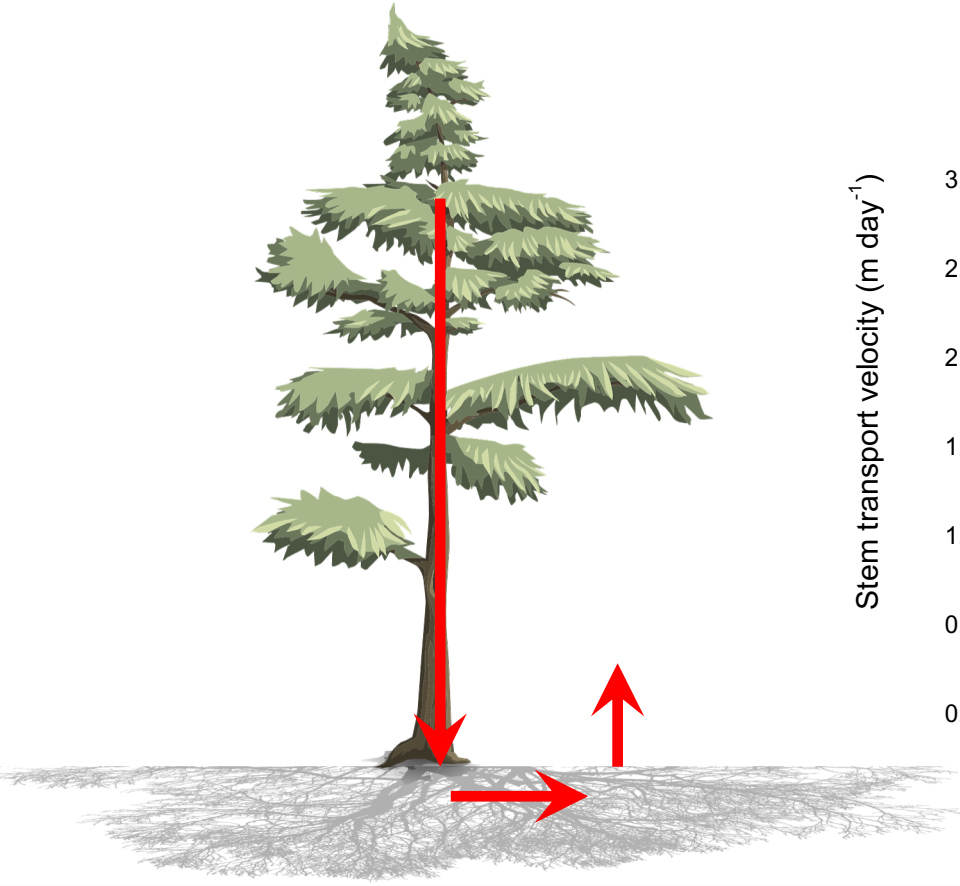
→ Strong increase in belowground allocation

# $^{13}\text{C}$ label is detectable for > 1 year



# Consequences for tree physiology

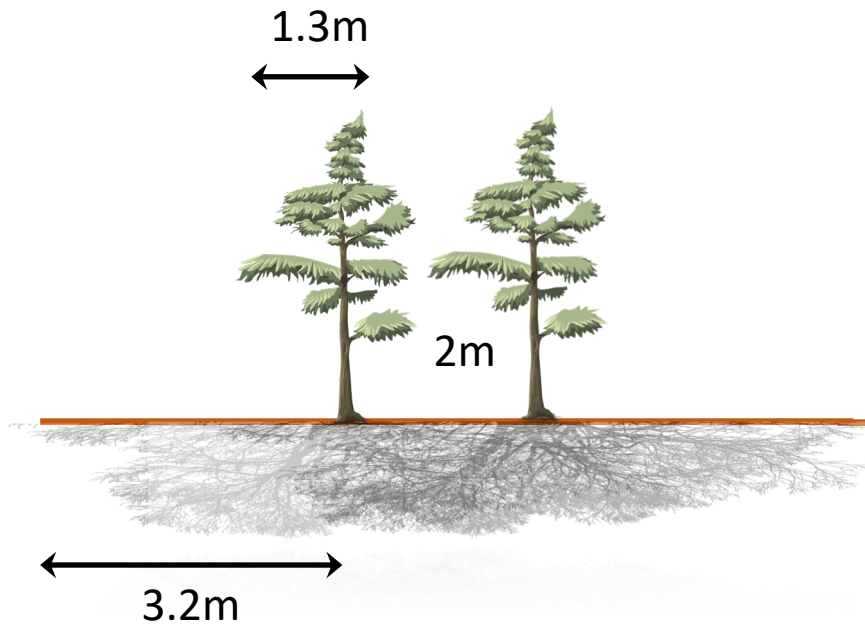
## Phloem transport



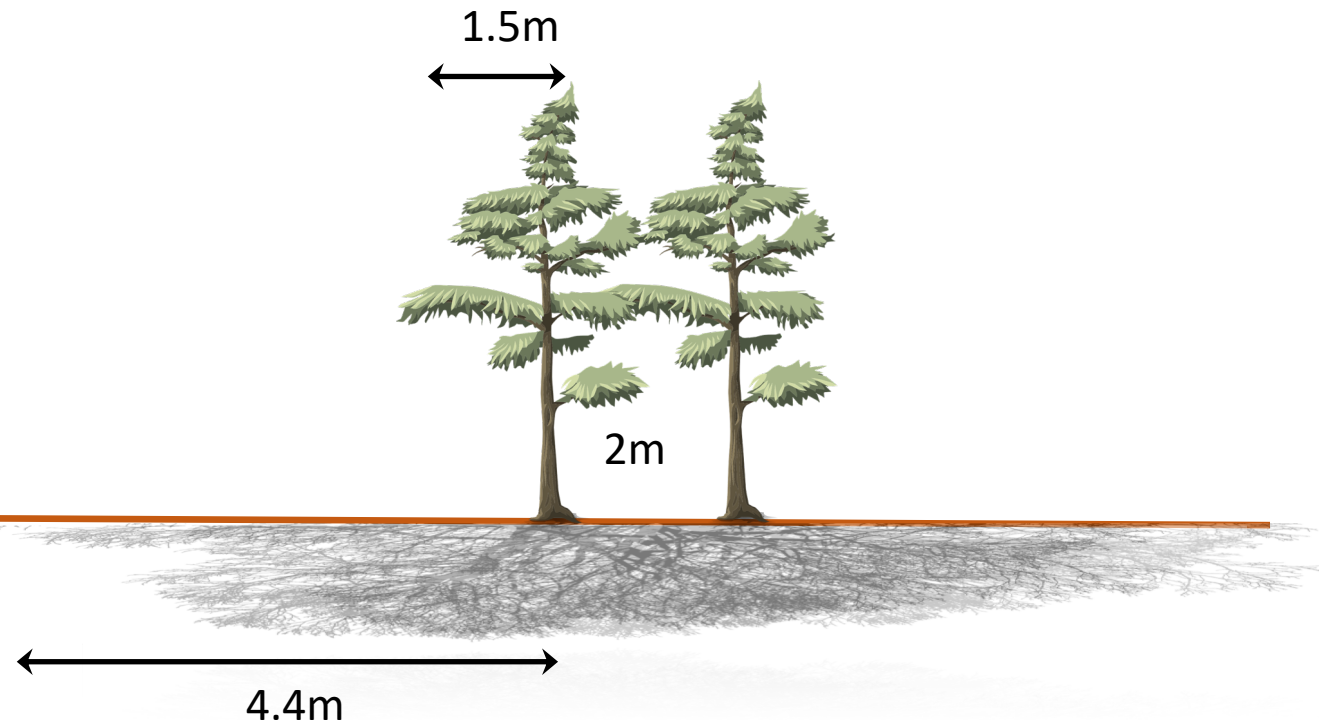
→ ~ 4 times slower than  
in non-water limited  
forests  
(Epron et al., 2012)

# Irrigation extends rhizosphere and overlap among trees

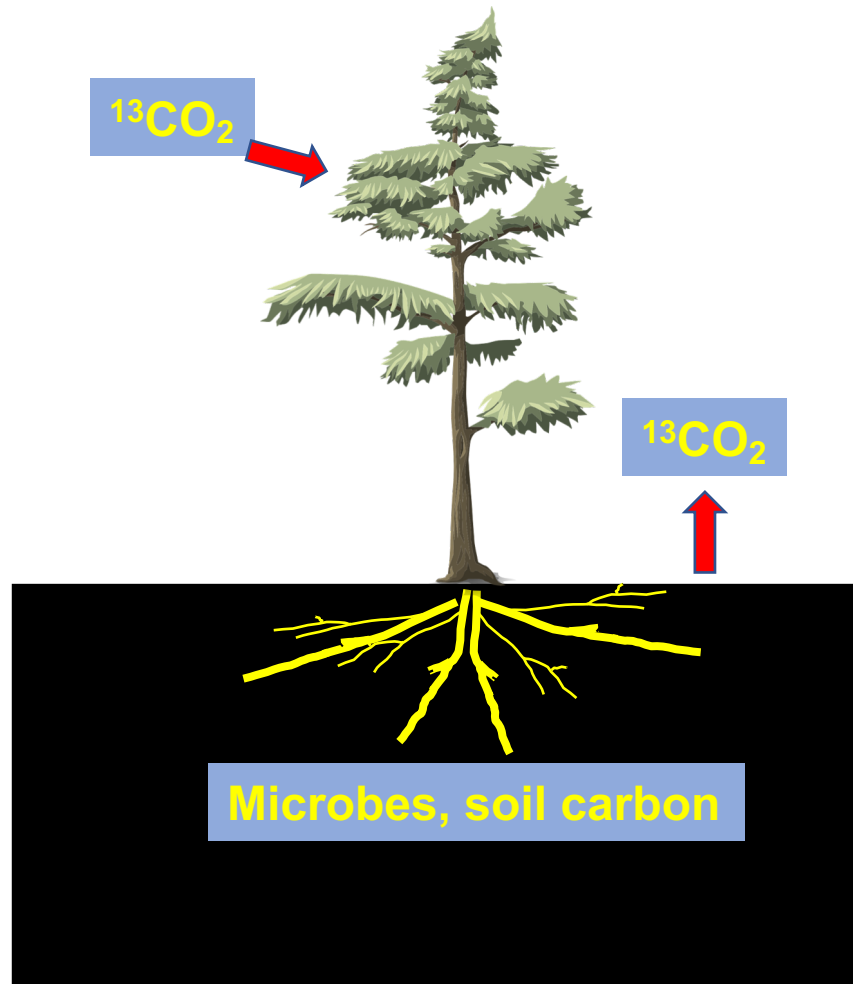
Natural dry



Irrigation



# Drought regime influences carbon footprint in soils



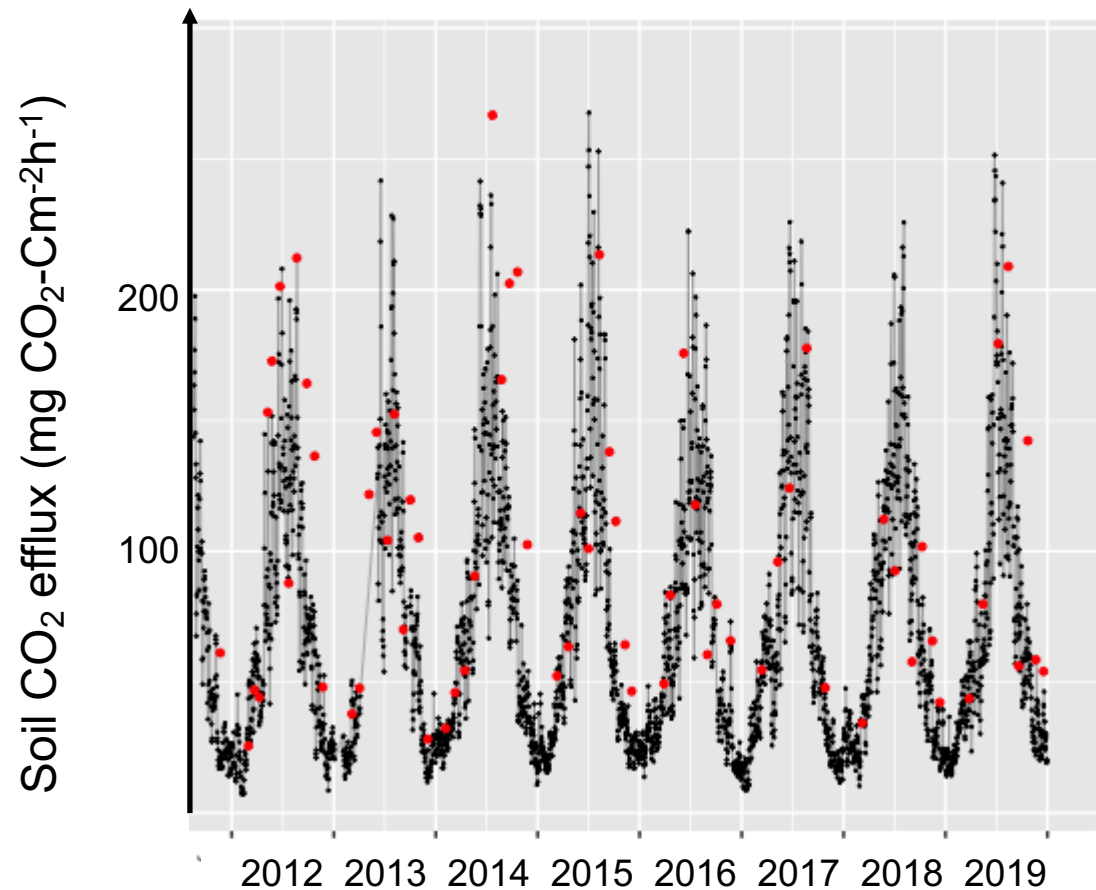
Threshold type soil moisture dependency  
of rhizosphere respiration

drives sink activity in soils

affects C balance of trees

impacts C-inputs into soils  
C-supply of microbes, soil C storage

# Next plans



**Modelling long-term data on soil respiration**



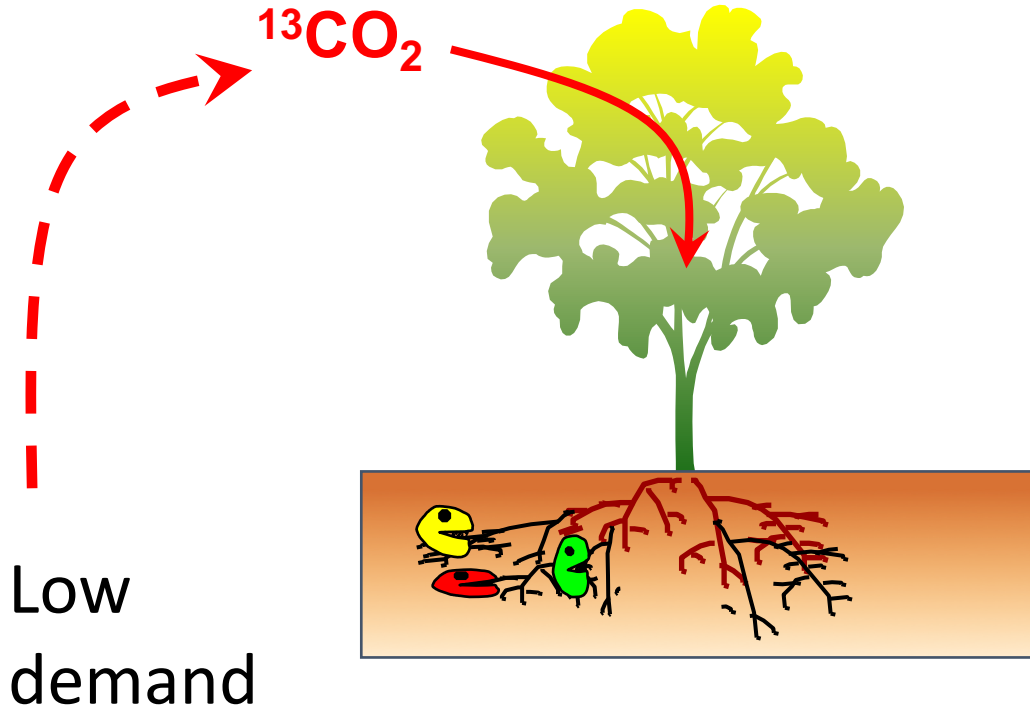
**Using radiocarbon to  
identify sources of soil respired CO<sub>2</sub>  
quantify soil C turnover**

Thank you !



# Close coupling between above- of assimilates

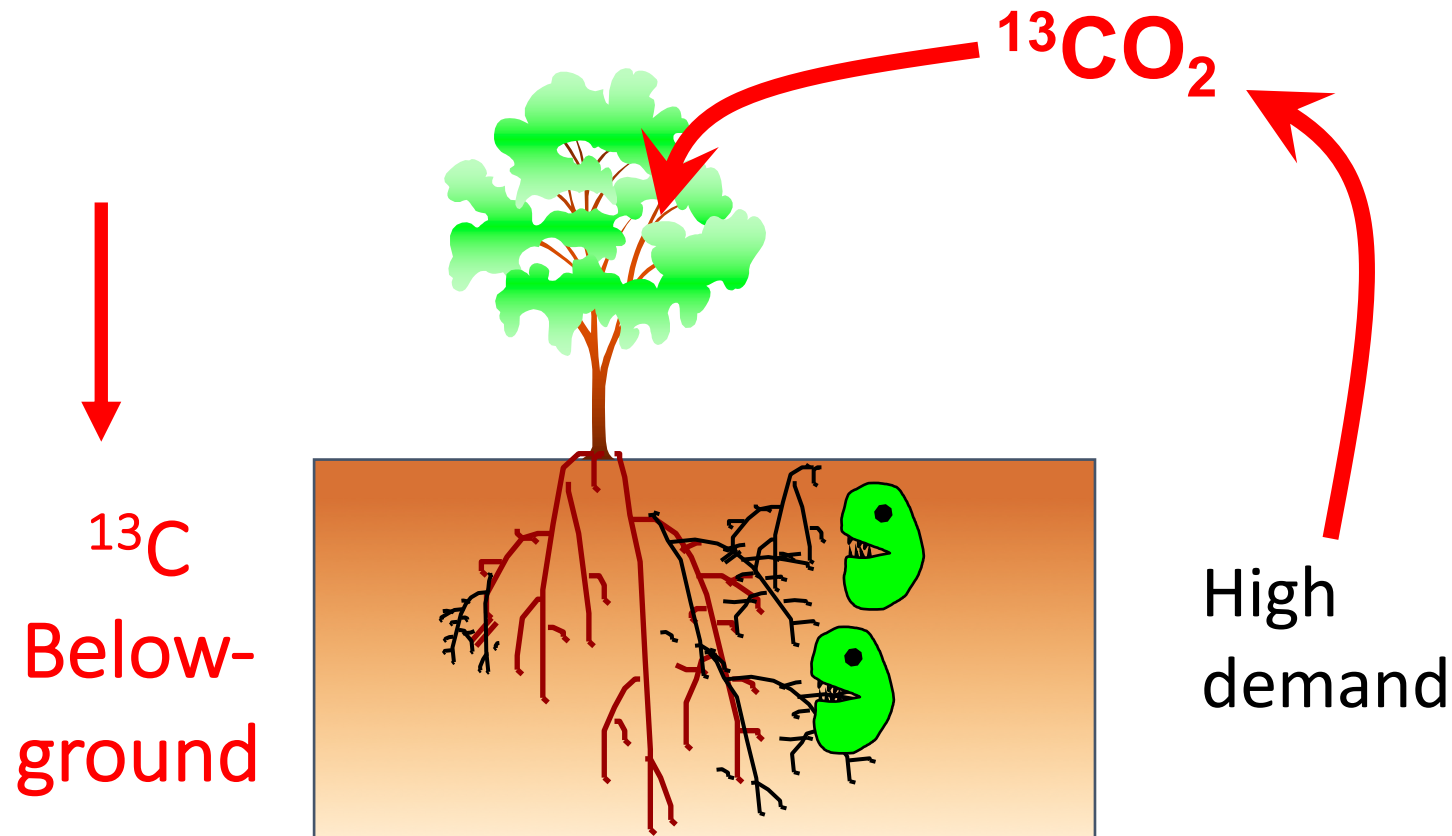
Moderate Dry



$14 \pm 2 \%$

of  $^{13}\text{C}$  assimilated

Irrigated or rewetting



$35 \pm 3\%$

