

# WHERE DO CROPS TAKE THEIR WATER FROM?

## USING ISOTOPIC TRACERS IN AGRICULTURAL AND AGROFORESTRY SYSTEMS

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# Rational

- 70 % of water resources is used for irrigation
- The pressure on water resources will increase due to the
  - growing population
  - increasing urbanization and industrialization
  - climate change

# Goal

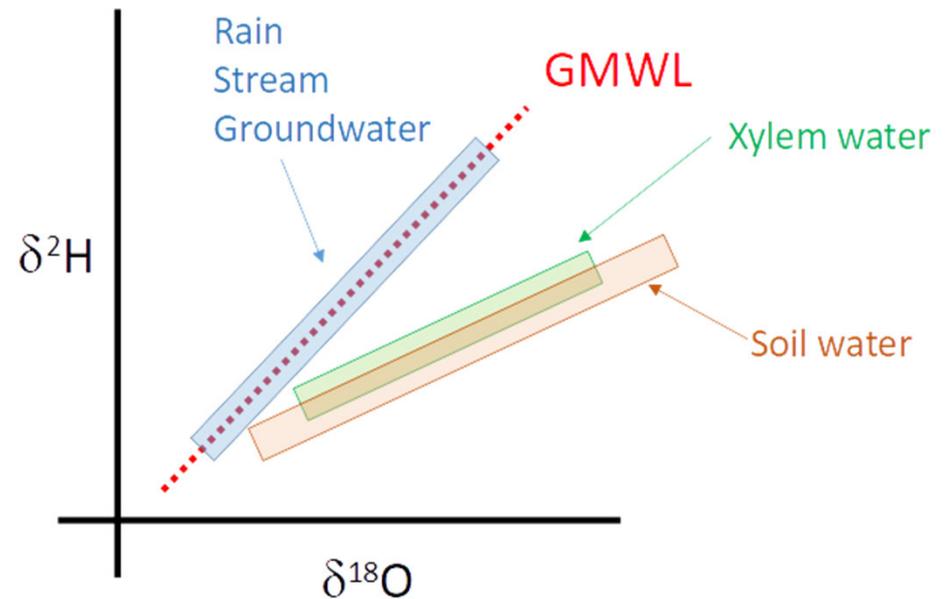
- To achieve an accurate quantification of the proportions of different water sources taken up by plants.
- This goal has important ecological and economic implications for water saving and utilization.

# Practical implications

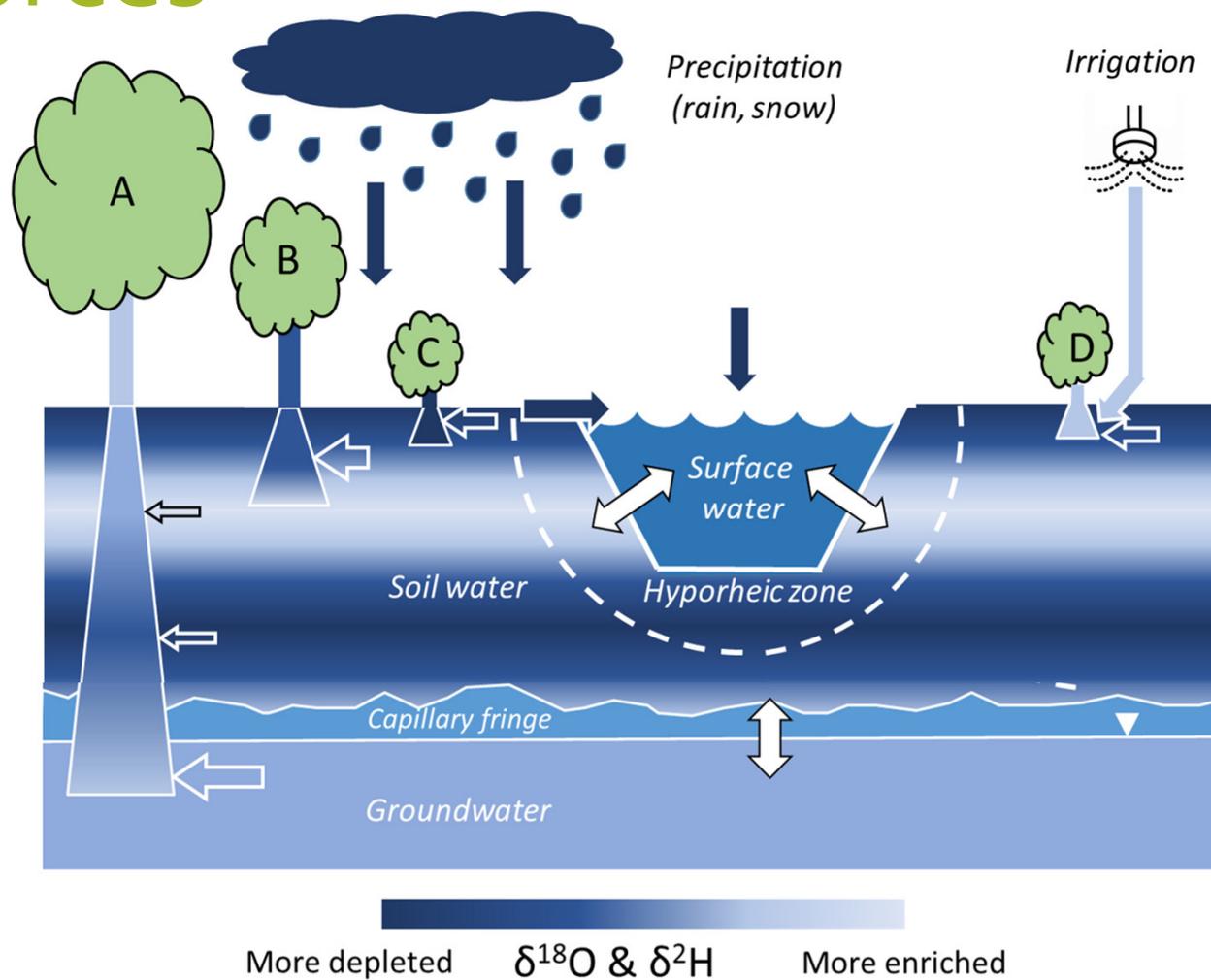
- Improving local to regional farming practices such as irrigation or fertilization treatment schemes
- Strategic planning at longer timescales in relation to changing hydroclimatological conditions (e.g. extreme weather events, droughts or altered flow regimes)
- Competitive or complementary water use strategies of co-existent species
- Understanding the implications of climate or management change
- Evaluating the need for irrigation especially for agricultural and agroforestry regions which are sustained at the natural limits of water availability.

# Stable isotopes as a tool

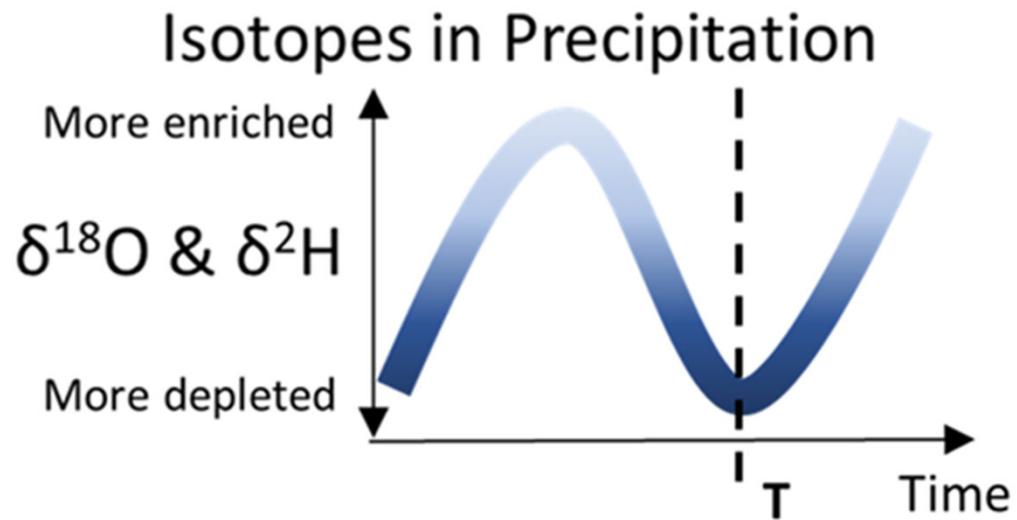
- Stable isotopes of water ( $^2\text{H}/^1\text{H}$ ,  $^{18}\text{O}/^{16}\text{O}$ )
- Understand temporal and spatial patterns of root water uptake (RWU)
- Tackle water management-related questions



# Crop roots access different water sources



# Precipitation isotopic signatures change with time



# Main points to clarify

- Water sources for plant uptake
- Effect of irrigation and fertilization on uptake
- Effect of co-existing plants

# Opportunities and challenges

- Methodological issues
  - Interaction water-soil and water-organic matter
  - Effect of root exudates
  - ...
- Mixing models
- Quantification of uncertainty



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### Water sources for root water uptake: Using stable isotopes of hydrogen and oxygen as a research tool in agricultural and agroforestry systems



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