

# Using Stable Isotopes to Assess Plant Water Use in Response to Drought in Organic and Conventional Systems

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## 1 Introduction

- Under the **changing climate**, agricultural production systems will be progressively subjected to more frequent severe weather events, including **prolonged summer droughts** [1, 2].
- Farming practices that better adapt to climate change are required to improve the resilience of agricultural systems and ensure food security.

## 2 Keywords

- Organic farming
- Plant water use
- Stable isotopes
- Drought

Research site:  
Ruemlang →



The FAST trial<sup>[3]</sup>  
Farming System and Tillage Experiment

## 3 Objectives

**ORGANIC**

**CONVENTIONAL**

VS

**TILLAGE**

**Reduced/NO TILLAGE**

To determine: (1) whether crops are more likely to use water from **deeper** soil layers during drought as in grassland systems, and how it differs from different farming systems;

(2) whether **organic farming** and reduced/no tillage farming can contribute to higher yields and higher resilience to drought compared to **conventional farming** and tillage farming.

## 4 Methods overview

↑ Thermal image  
Plant growth and physiological performances

← Leaf stomata  
Leaf transpiration rate and stomatal conductance, root distribution, soil water dynamic...

**Simulated drought** ← Portable roofs

↓

**Crop ecophysiological responses**

Water use

Water uptake

↓ assess

**Resilience\* of agricultural systems**

\* The capacity to respond to and recover from a perturbation or disturbance by **resisting** damage and **recovering** quickly.

Samples: Soil    Plant    Precipitation

vacuum extraction system

Isotope ratio mass-spectrometer

Stable isotope ratios of oxygen and hydrogen

Proportional contribution of water sources

IsoSource model  
Bayesian mixture model et. al.

$^2\text{H}$

$^1\text{H}$

$^{18}\text{O}$

$^{16}\text{O}$

## 5 References

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