

# Does the cover crop residue management affect the soil water availability for plants?

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Four modalities studied (Pictures: M.-P Hiel, 2013)

## Electrical resistivity tomography (ERT):

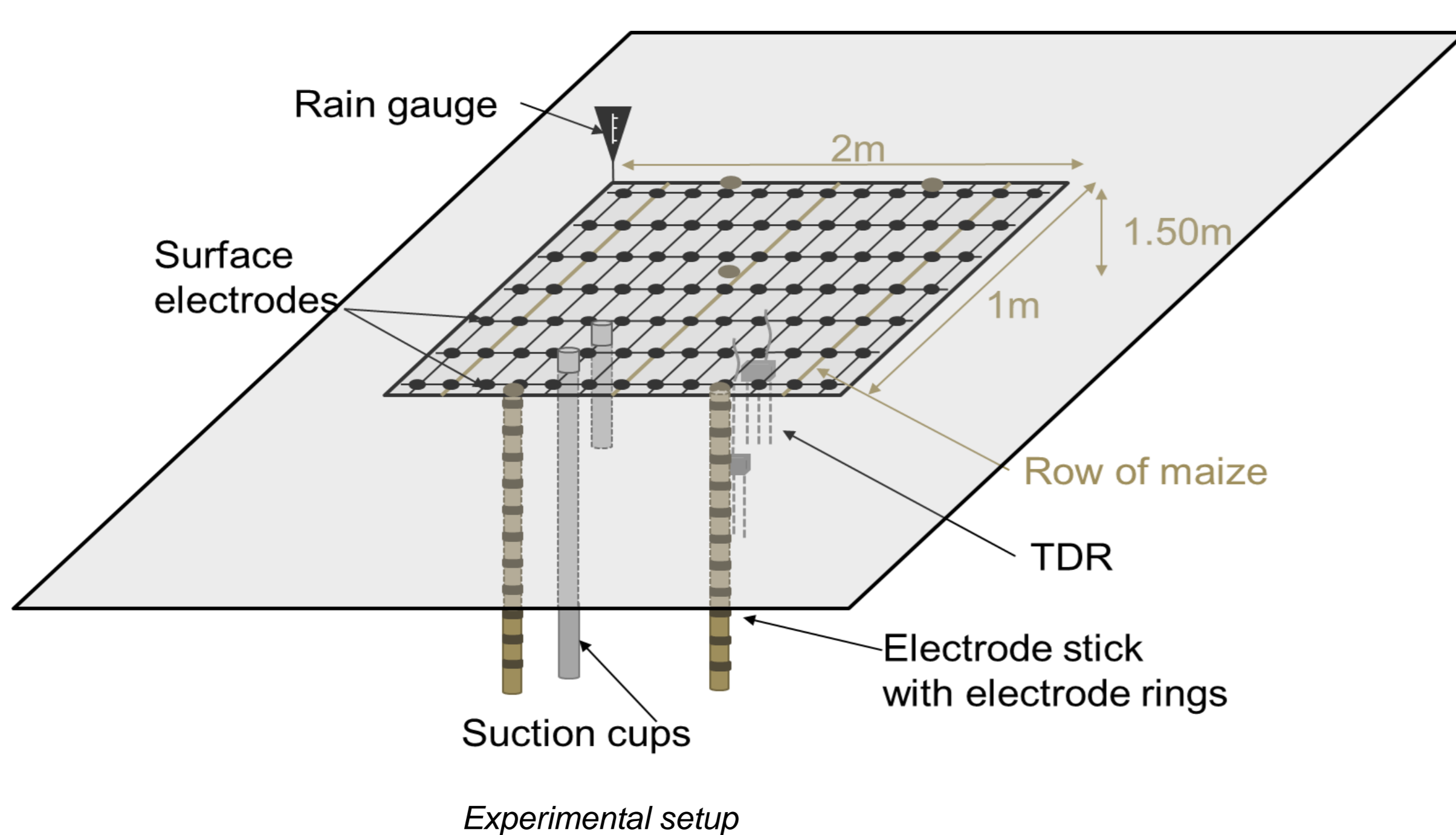
- **Advantages:** few invasive, measurements at a greater scale than traditional methods, adapted to monitor the evolution of soil water content over time
- **Principle:** injection of current between two electrodes and measurement of the difference of potential between two other electrodes
- **Measurement:** timelapse bulk electrical resistivity

## Determination of the petrophysical relationship:

- Calibration pit: at four different depths, setup of four stainless steel electrodes, a time domain reflectometry (TDR) probe and a temperature sensor
- 4x2 suction cups close to each plot

## Experimental setup for each of the treatment:

- At the surface: stainless steel electrodes supported by a plastic grid
- Under ground: electrode sticks with electrode rings

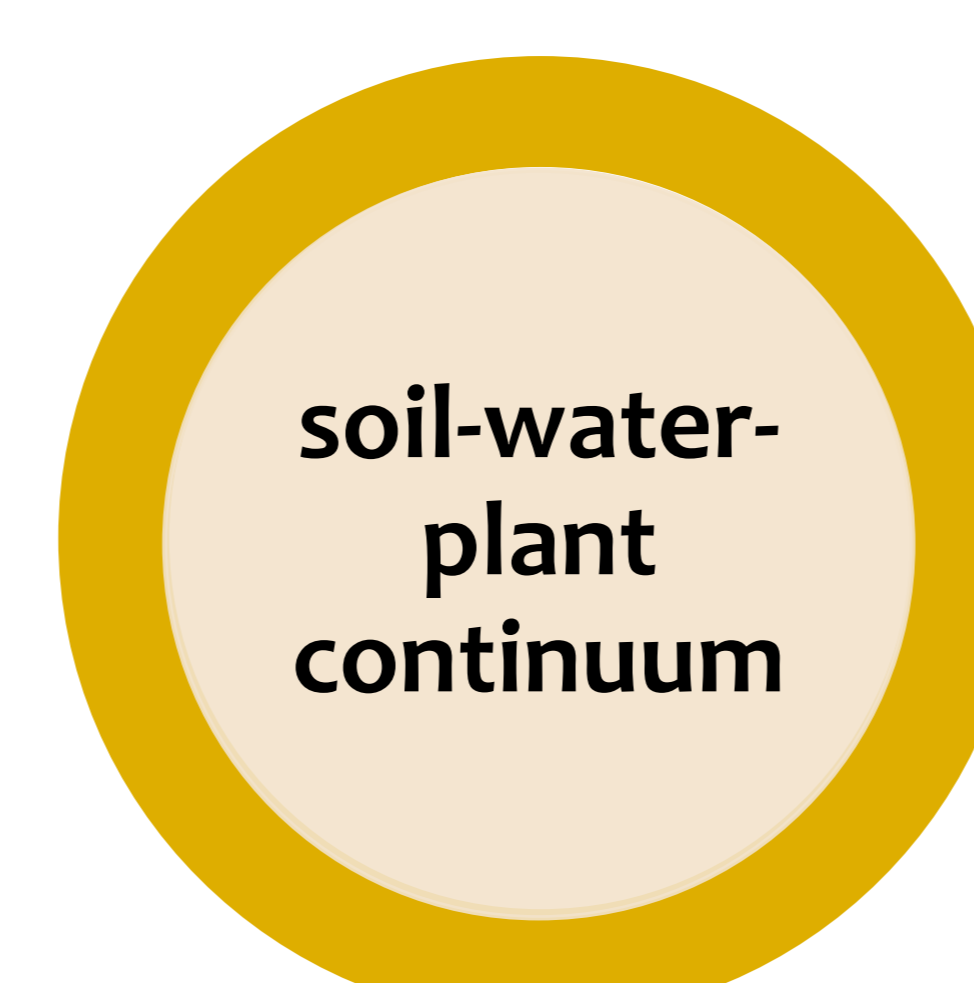
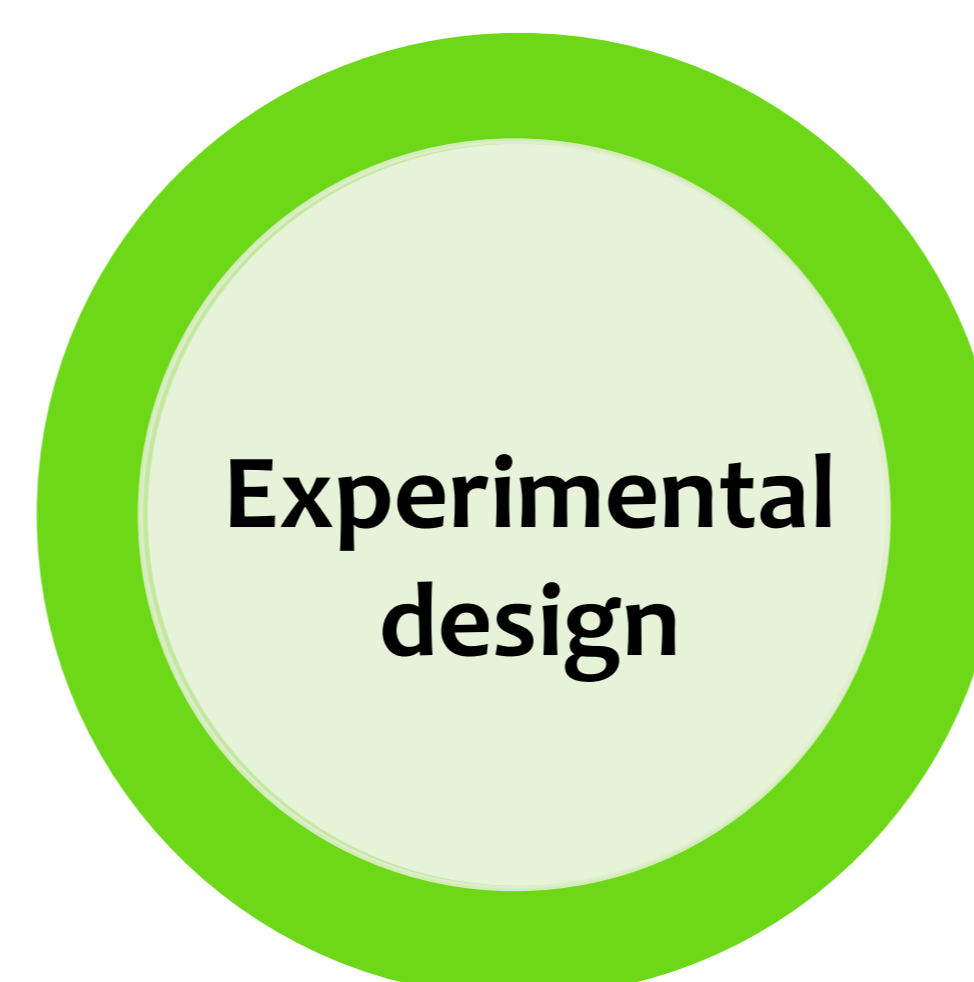
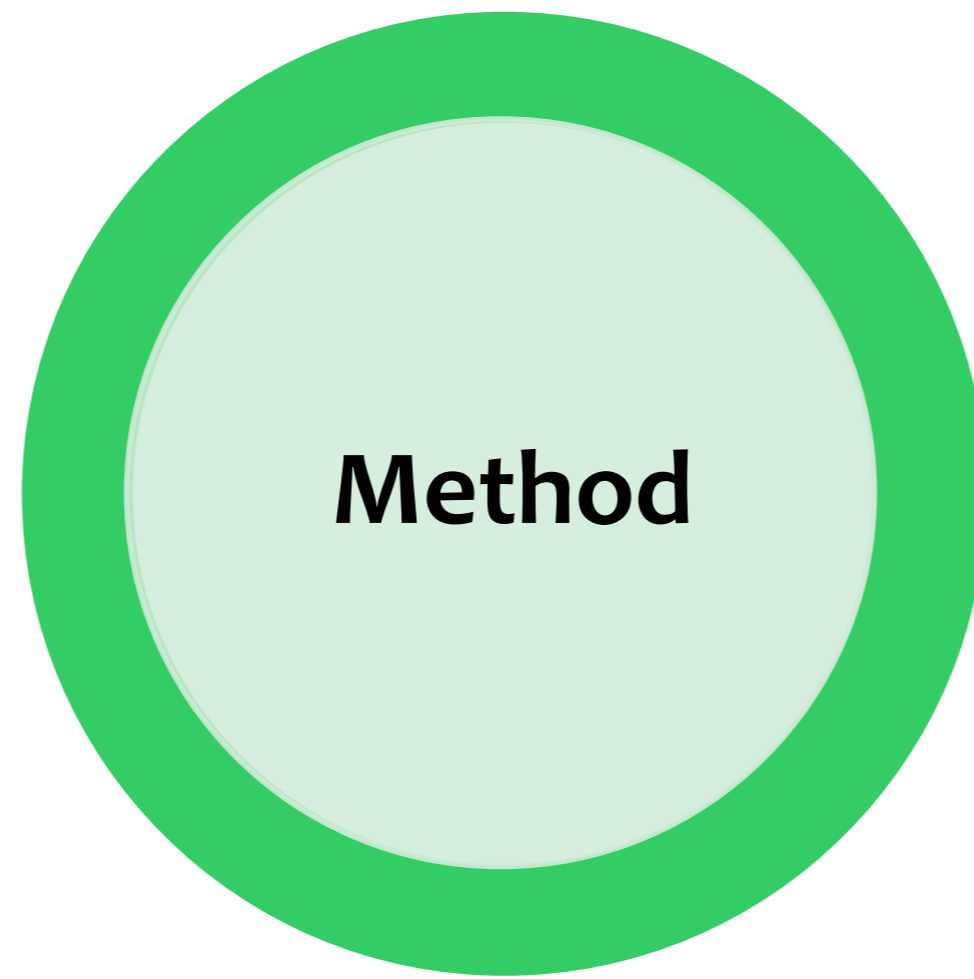
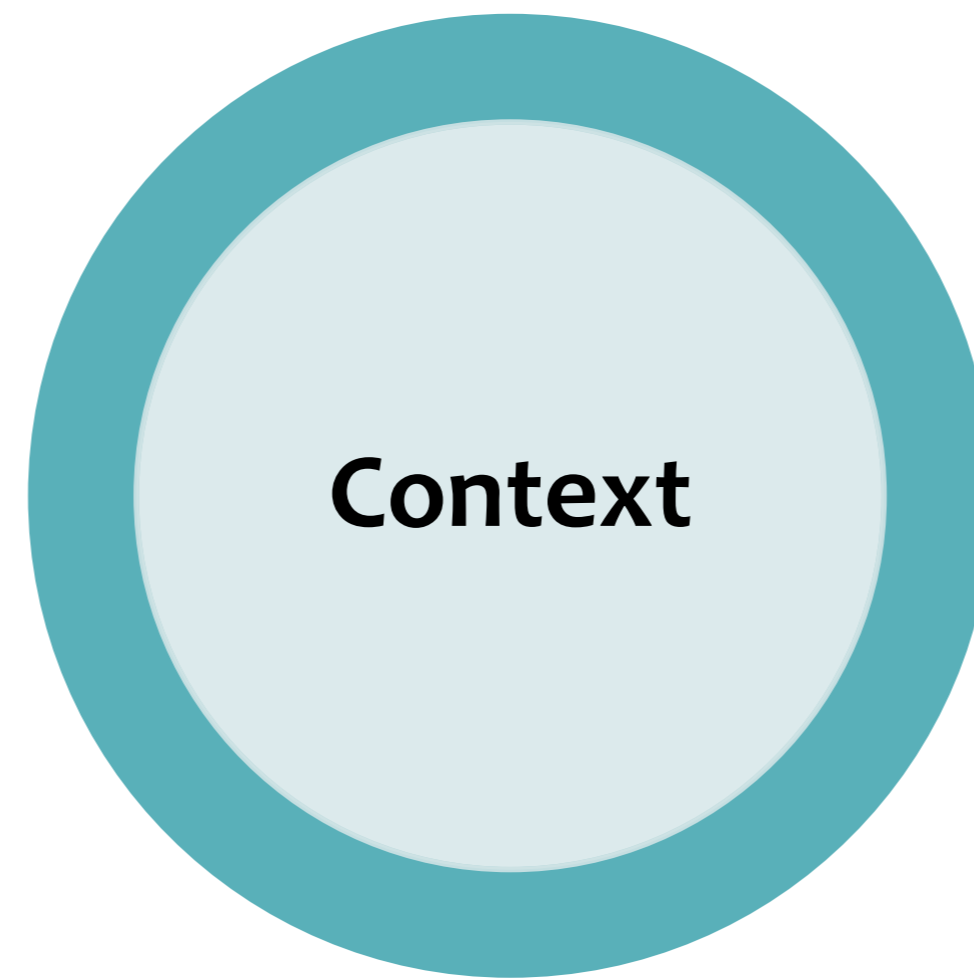


Experimental setup

## AgricultureIsLife: an interdisciplinary project

Collaboration with:

- **N.Parvin**, A.Degré: Evolution of the soil structure
  - Soil hydraulic properties
  - Detailed soil structure thanks to X-ray tomography
- **M.-P Hiel**, B.Bodson: Maize development
  - Number of emerged plants
  - Biomass
  - Leaf Area Index (LAI)
  - Evolution of weed population
  - Yields and quality of the harvested products
  - Presence of diseases and pests
  - Nitrogen uptake by the plants



## Hypothesis:

The late cover crop residue management:

- Limits the formation of crusts at the soil surface (↓ raindrop energy)
- Improves the pore network by the root development
- Limits the evaporation during winter

The use of strip-tillage to manage the cover crop residues:

- Limits the formation of crusts at the soil surface during the growing season (↓ raindrop energy)
- Limits the creation of a ploughpan in depth

## BUT:

Inconsistencies between the studies (see e.g. Green et al., 2003)

## Field conditions:

- Climate
- Type of soil
- Technical itinerary

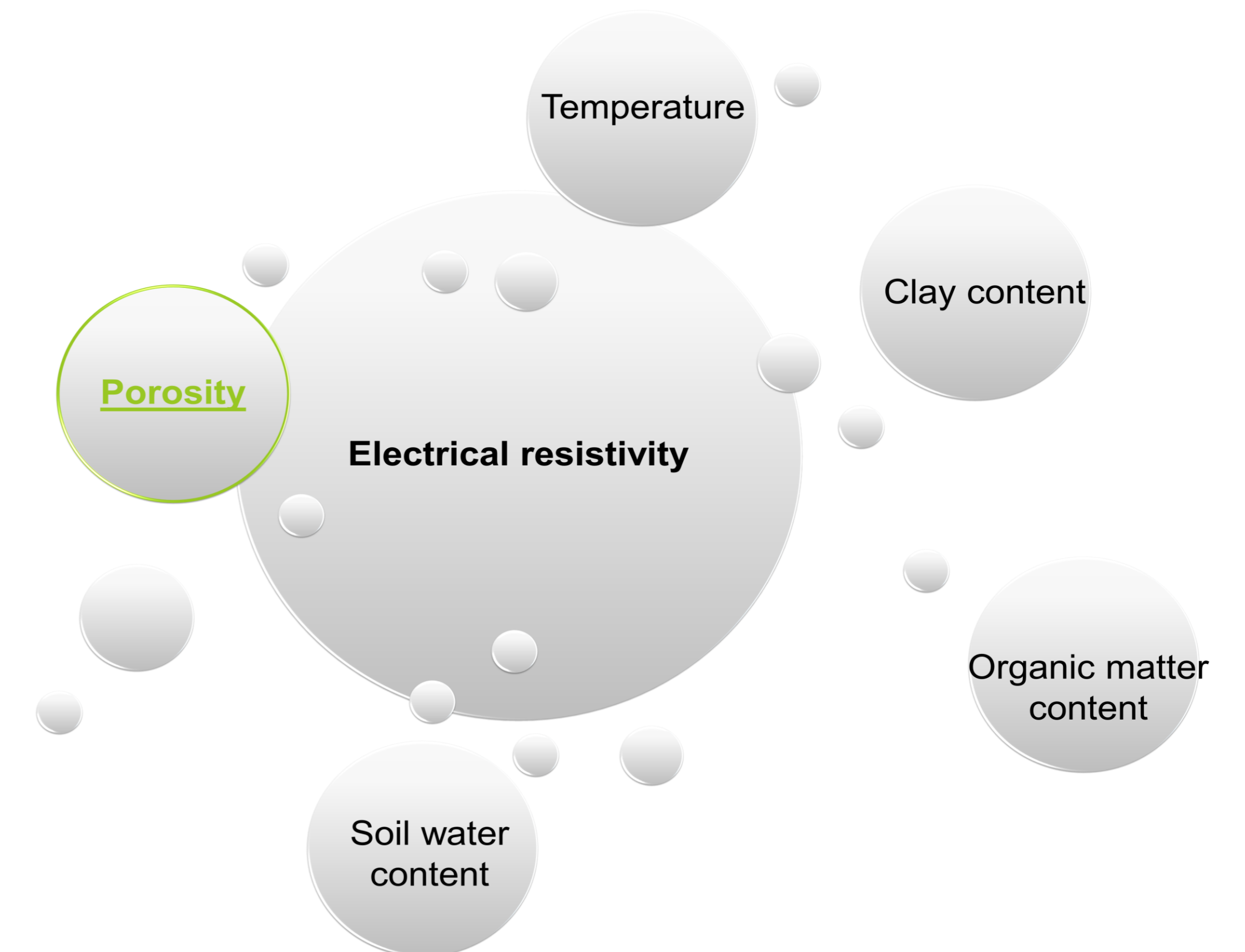
## WHY?

## Measurement methods:

- Moisture sensors
- Soil sampling

## Space and time

- Frequency
- Depth



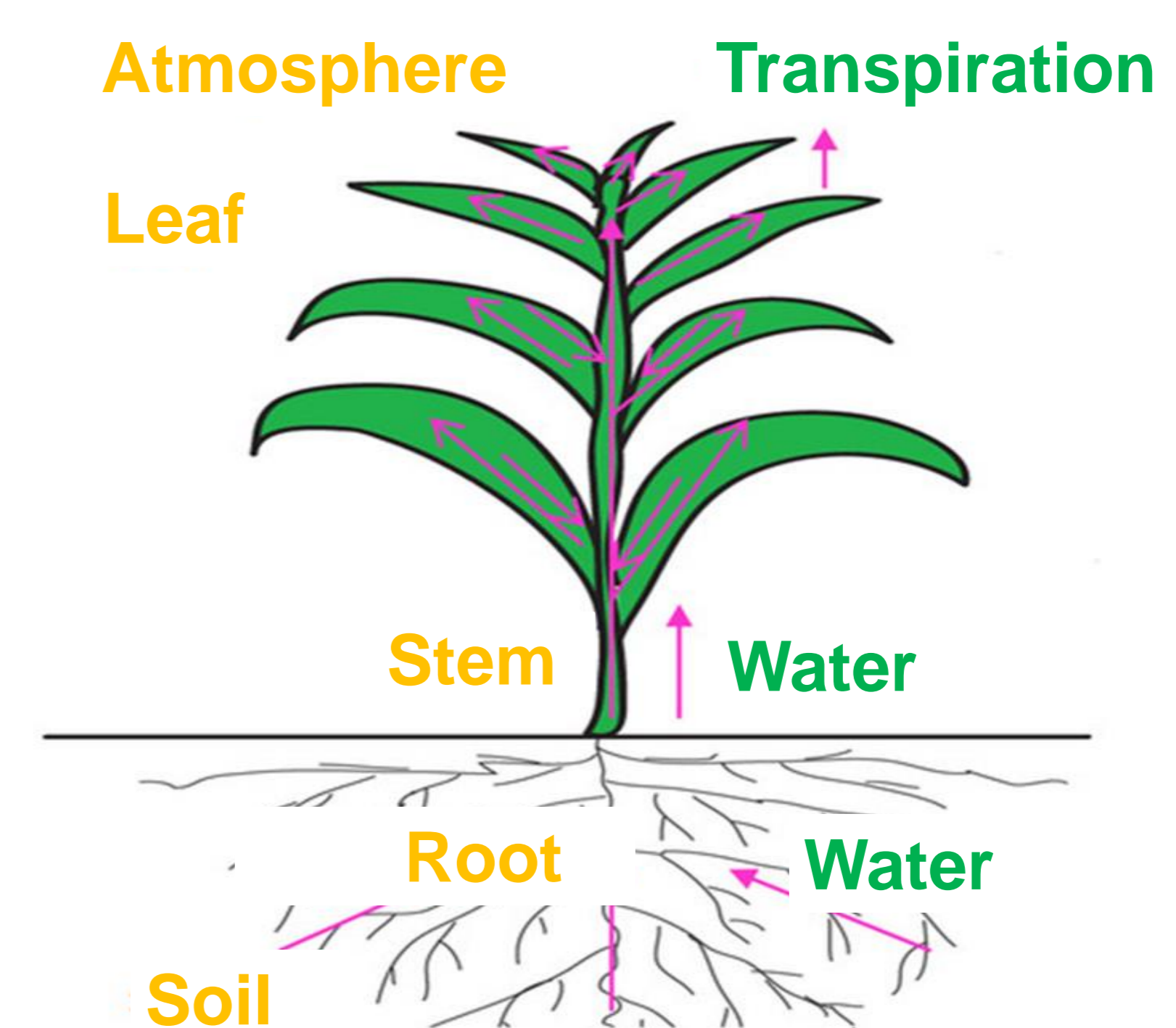
Porosity: one of the main factors affecting electrical resistivity

## Validation:

- Two TDR probes
- Meteorological data

## Space and time consideration:

- Location: Gembloux (Belgium), Cutanic Siltic Luvisol (WRB)
- Surface: 2x1m, including three rows of maize
- Maximal depth of investigation: ±1.50m
- Resolution: ± 0.15 m
- Interval: from April (maize sowing) to October 2015 (harvesting)
- Frequency: every week



Soil-water-plant continuum (after Zhuang et al., 2014)