

What soil instrumentation can tell us about water and nitrate movement in the root-zone of crops?

CDFA Project:

Evaluation of cover crop in reducing nitrate leaching in tomato fields

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With the help of soil sensors and monitoring techniques, we aim at quantifying:

- Water and nitrate uptake by crop roots
- Water and nitrate leaching below the root zone
- The spread of irrigation water in the soil profile in relation to roots
- etc.

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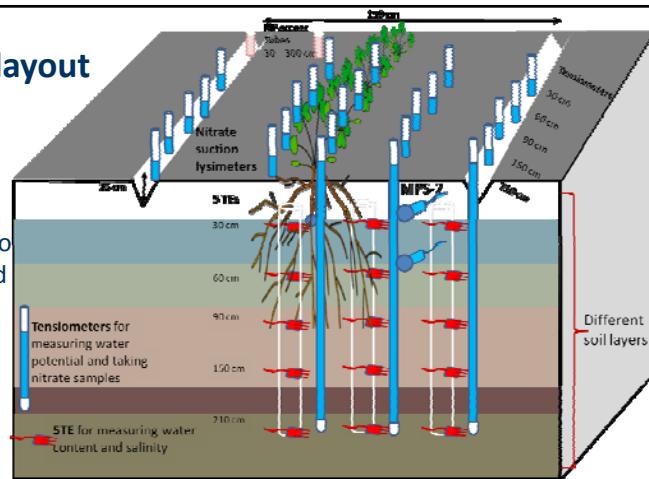
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Instrumentation layout

- Multiple sensors at various depths and locations for each treatment plot
- Sensors are connected to loggers and data collected remotely
- Hourly and daily measurements of water and nitrate redistribution following irrigation, fertigation and uptake by roots



Treatments:

Winter fallow

Triticale

Bell beans



Instruments list and functions:

1. Tensiometers:
measures soil matric potential, range: -850 - 0 mbar,
individually-calibrated pressure transducers
Also used for calculating flux across a known soil layer by
logging the water potential gradients
2. Decagon 5TE sensors:
measures soil water content, electrical conductivity,
temperature
3. Decagon MPS-2 sensors:
measures soil matric potentials, range -4000 mbar – 0
4. Neutron Probe
measures soil water content, large representative soil
volume
5. Suction lysimeters (empty tensiometers):
is used to collect soil solution for nitrate analysis
6. Equilibrium-Tension Lysimeters:
measures drainage below the root zone and collect soil
solution samples for nitrate analysis



An example of soil moisture monitoring:

- Moving water extraction depth in the soil profile as roots grow deeper
- Soil matric potential shows how hard it is for roots to extract water from soil
- the drier the soil the more negative matric potential

