Performances of subsurface drip Irrigation for maize under Mediterranean and temperate Oceanic climate conditions

Rami ALBASHA
rami.albasha@irstea.fr

On behalf of the team of the experimental platform Lavalette
Irstea research institut
Presentation outlines

1. The message
2. Describing the experiments
3. Results
4. Conclusions and perspectives
Subsurface drip irrigation (SDI) may represent an efficient technique to increase irrigation water productivity (IWP=\(\Delta\text{yield}/\text{irrigation}\))

but…

SDI may not reduce significantly irrigation water use without significantly reducing yield.
Describing the experiments

Two sites

1. under two contrasted climatic conditions

Lavalette
Mediterranean climate

La Mirandette
Oceanic transition climate

(Source: MétéoFrance)
Describing the experiments

Two sites

2. with similar soil types but slightly different holding capacities

**Lavalette**
Deep loamy soil
Holding capacity of 180 mm m\(^{-1}\)

**La Mirandette**
Loam sandy clay
Holding capacity of 130 mm m\(^{-1}\)
Describing the experiments

Growing cycles 2012 and 2013

One crop: maize (*Zea mays* L.)

Irrigated surfaces in France
Survey of 2010

- Maize
- La Mirandette
- Lavalette
Describing the experiments

Main question: would SDI allow for significant water savings compared to traditional irrigation systems (sprinkling) in France?

Deficit irrigation SDI (80-85% ETc)
Vs
full irrigation using sprinkling systems (100% ETc)

Treatments
Describing the experiments

The layout

Lavalette

La Mirandette

Sprinkling (raingun)

Rainfed

SDI-160

SDI-120

(large)

(narrow)

Sprinkler

Rainfed

SDI-150

SDI-100

(large)

(narrow)
Describing the experiments

The layout

Observations

• Crop growth via Leaf Area Index;

• Soil water status over the soil profile down to 150-180 cm below soil surface (neutrons probe);

• Dry matter estimation (total and marketable yields)

For results analysis : Subplots were treated and repetition source.
1. Water demand and supply

Lavalette

La Mirandette
2. Enhanced uptake from deeper soil layers using SDI with deficit irrigation strategy

Lavalette 2012

But to a lesser extent at La Mirandette

La Mirandette 2012
3. Similar development of LAI under full and deficit irrigation

Lavalette 2012

La Mirandette 2012
4. SDI tends to increase IWP in Mediterranean climate conditions but not in Oceanic ones, especially if fertigation is used.

5. Deficit irrigation using SDI led to a net decrease in GY at Lavalette, not at La Mirandette.

6. Large dripline spacing **classically recommended** (150-160 cm) affected grain yield negatively under the Mediterranean climate.
Conclusions and perspectives

SDI may represent an efficient technique to increase irrigation water productivity

but…

SDI may not reduce significantly irrigation water use without significantly reducing yield.

More robust studies lacks for agronomic experiments in France, which combines water, fertilizer and energy use efficiencies.
Thank you for your attention