

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



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Presentation outlines

- 1. The message**
- 2. Describing the experiments**
- 3. Results**
- 4. Conclusions and perspectives**



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The message

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.



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Describing the experiments

Two sites

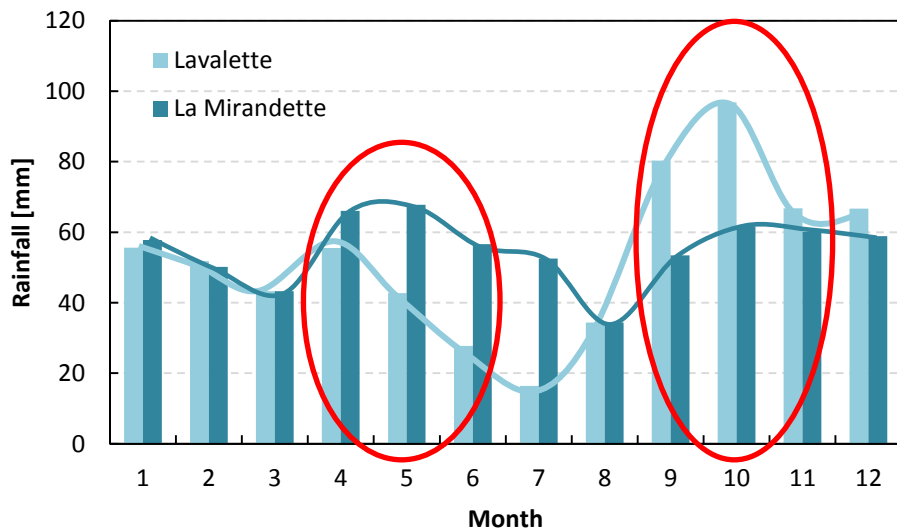
1. under two contrasted climatic conditions

Lavalette

Mediterranean climate

La Mirandette

Oceanic transition climate



(Source: MétéoFrance)



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Longitude : 2° 01' 28.6" E
Latitude : 46° 32' 08.5" N



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Describing the experiments

Two sites

- with similar soil types but slightly different holding capacities

Lavalette

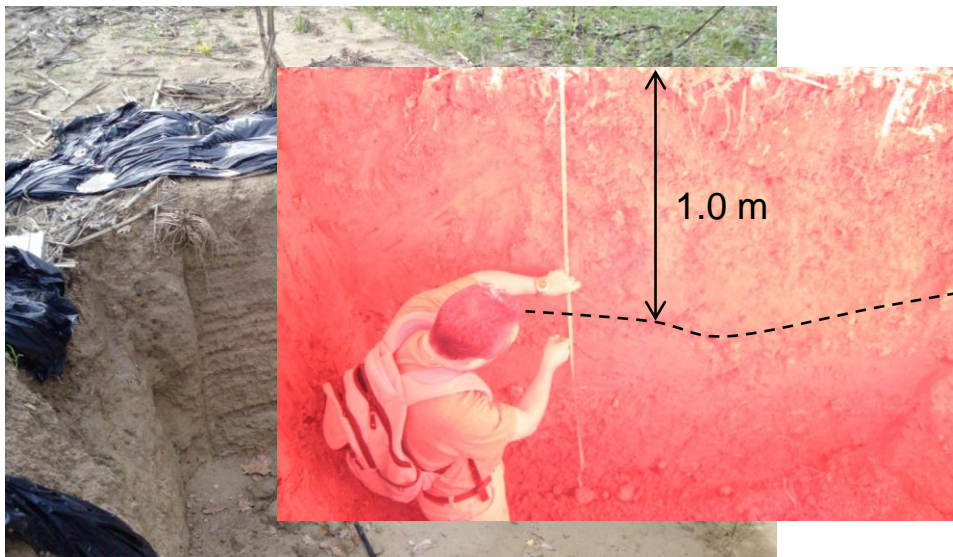
Deep loamy soil

Holding capacity of 160 mm m⁻¹

La Mirandette

Loam sandy clay

Holding capacity of 130 mm m⁻¹



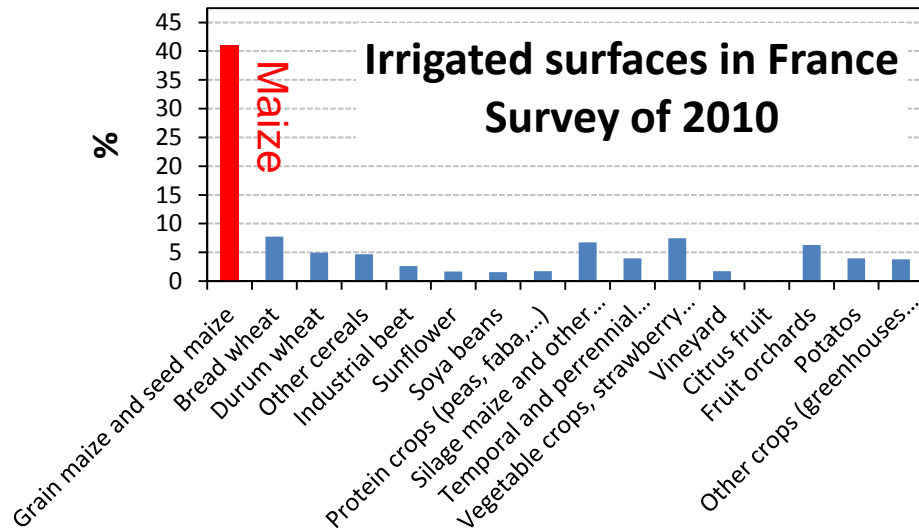
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Longitude : 2° 01' 28.6" E
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Describing the experiments

Growing cycles 2012 and 2013

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



Describing the experiments

Treatments

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

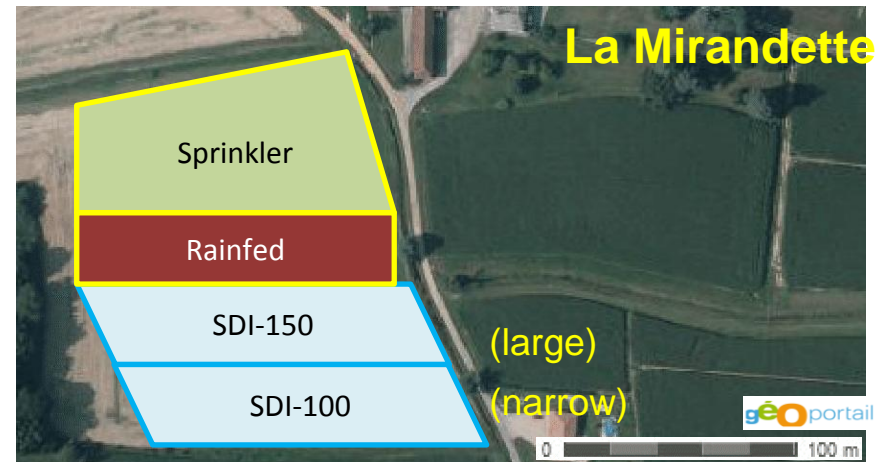
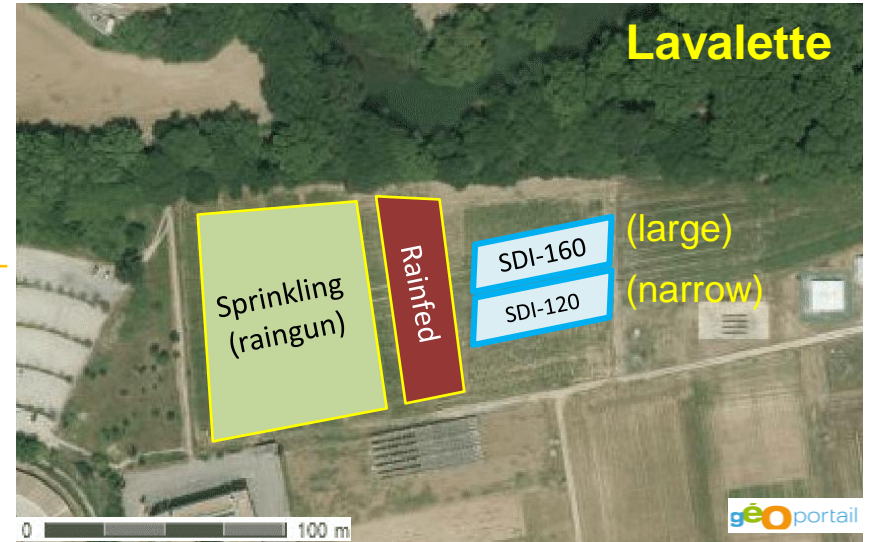
Deficit irrigation SDI (80-85% ET_c)

Vs

full irrigation using sprinkling systems (100% ET_c)

Describing the experiments

The layout



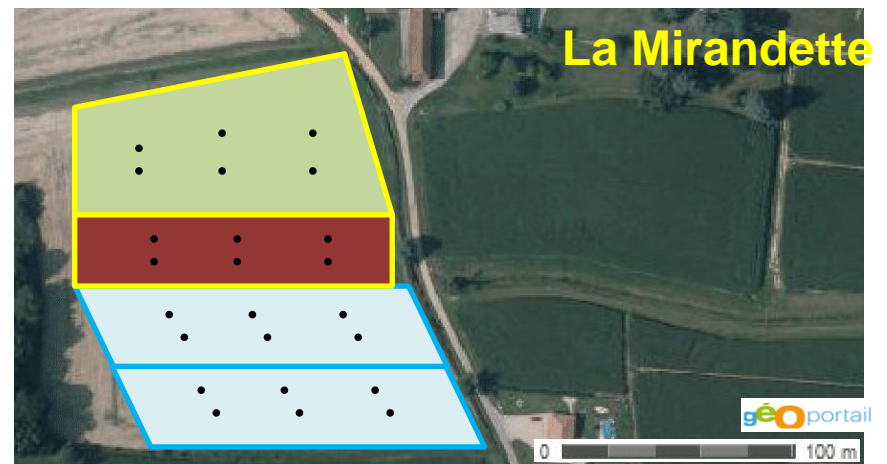
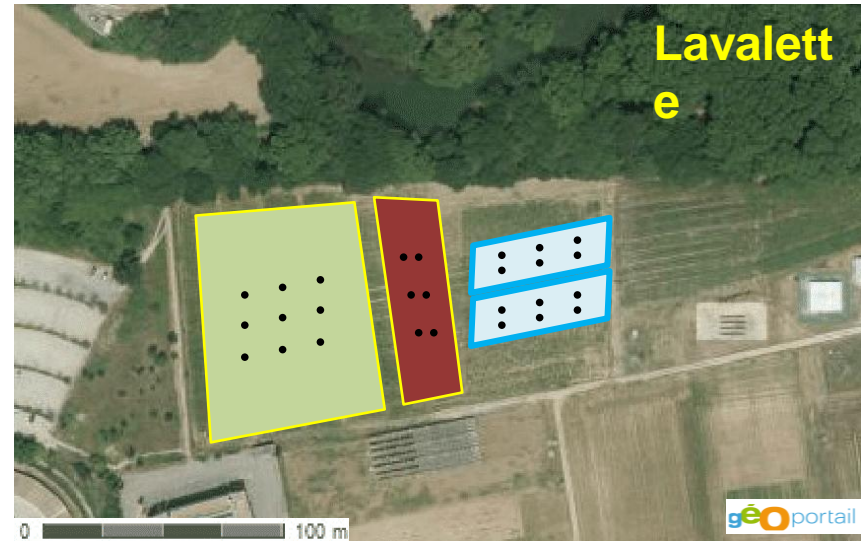
Describing the experiments

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.





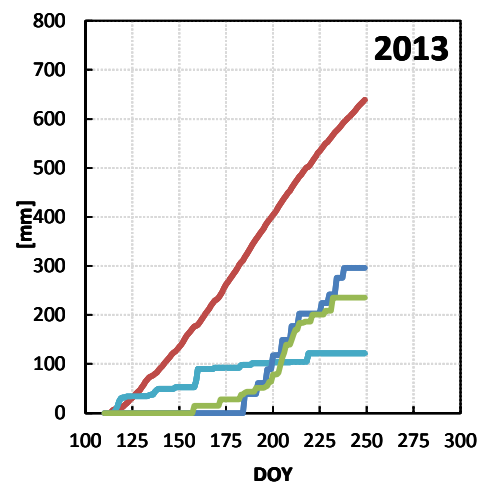
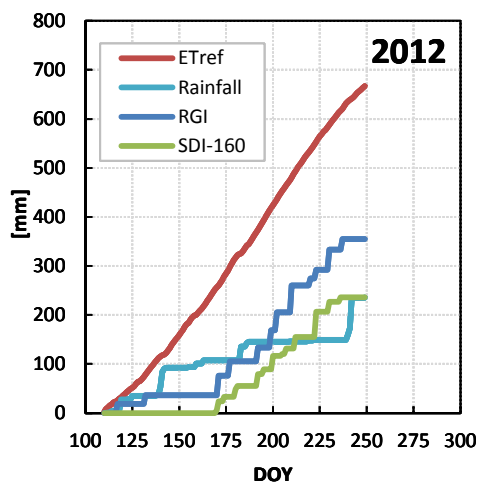
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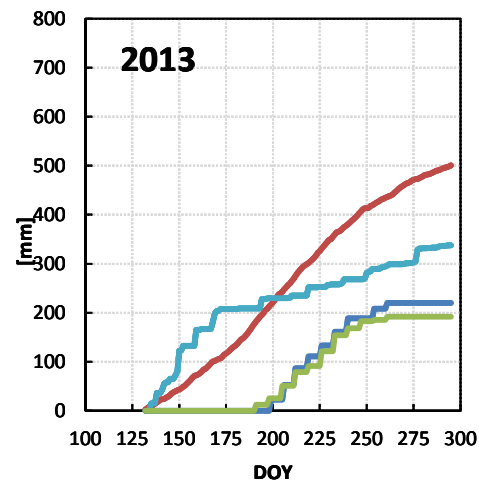
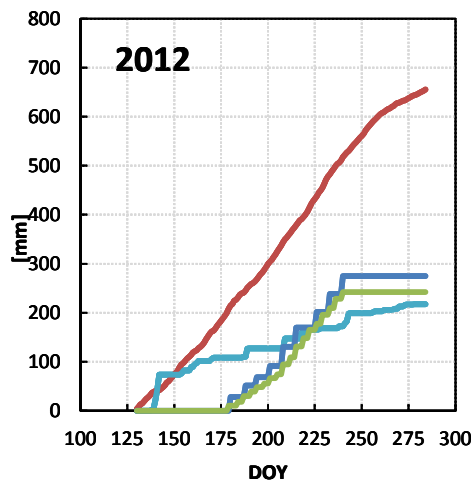
Results

1. Water demand and supply

Lavalette



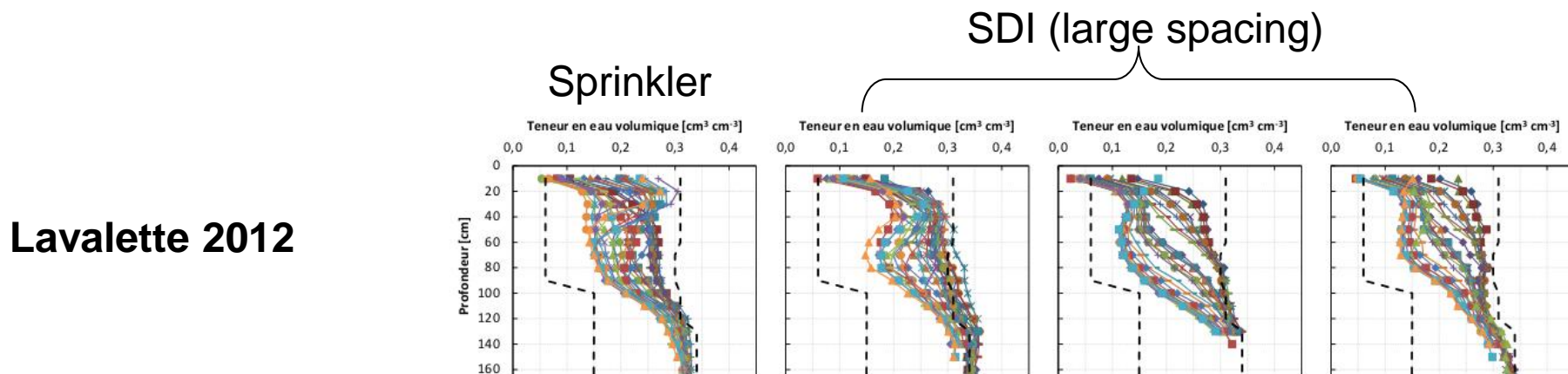
La Mirandette



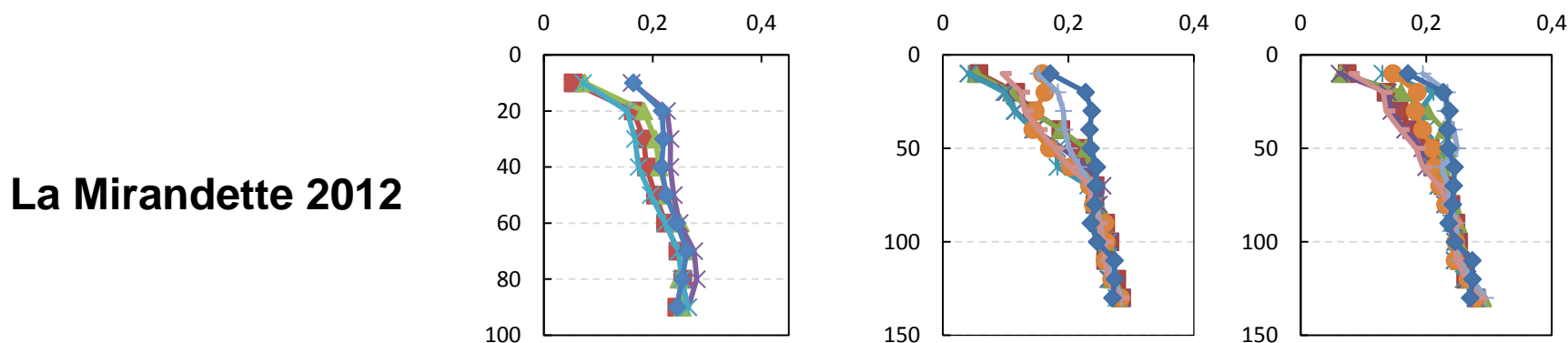


Results

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



But to a lesser extent at La Mirandette

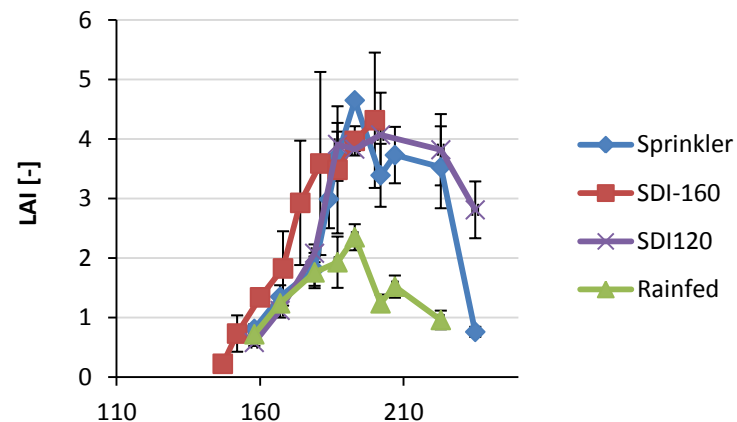




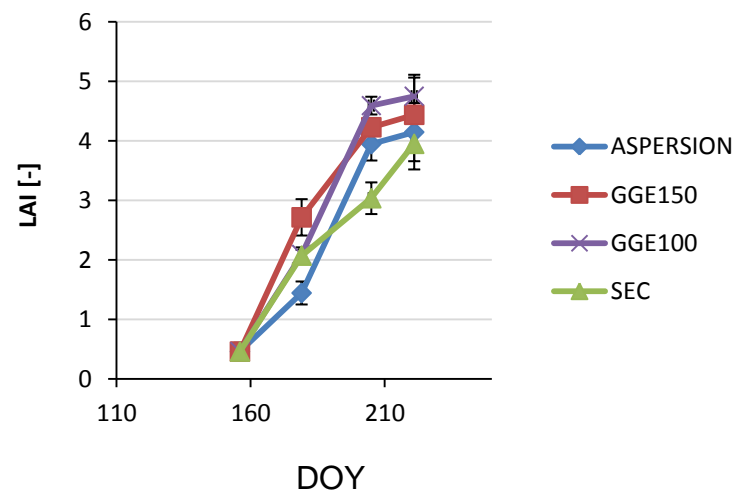
Results

3. Similar development of LAI under full and deficit irrigation

Lavalette 2012



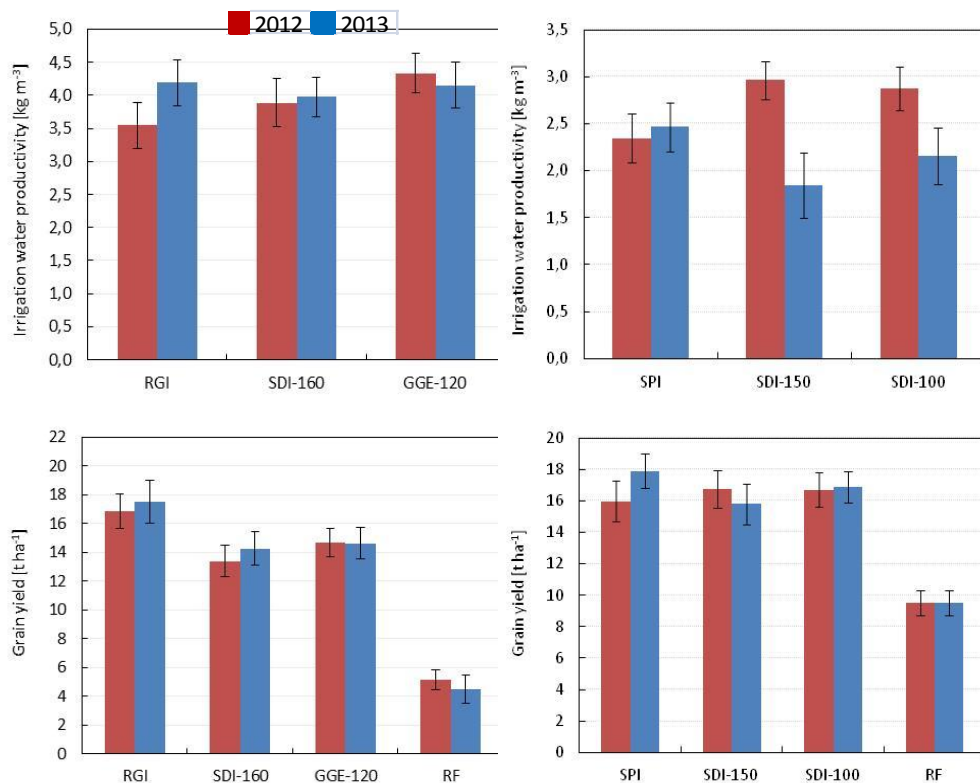
La Mirandette 2012





Results

- SDI tends to increase IWP in Mediterranean climate conditions but not in Oceanic ones, especially if fertigation is used
- Deficit irrigation using SDI led to a net decrease in GY at Lavalette, not at La Mirandette.
- Large dripline spacing **classically recommended** (150-160 cm) affected grain yield negatively under the Mediterranean climate.





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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

