



FIGARO

FLEXIBLE AND PRECISE IRRIGATION
PLATFORM TO IMPROVE FARM-SCALE
WATER PRODUCTIVITY

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Programme
funded by the
EUROPEAN UNION

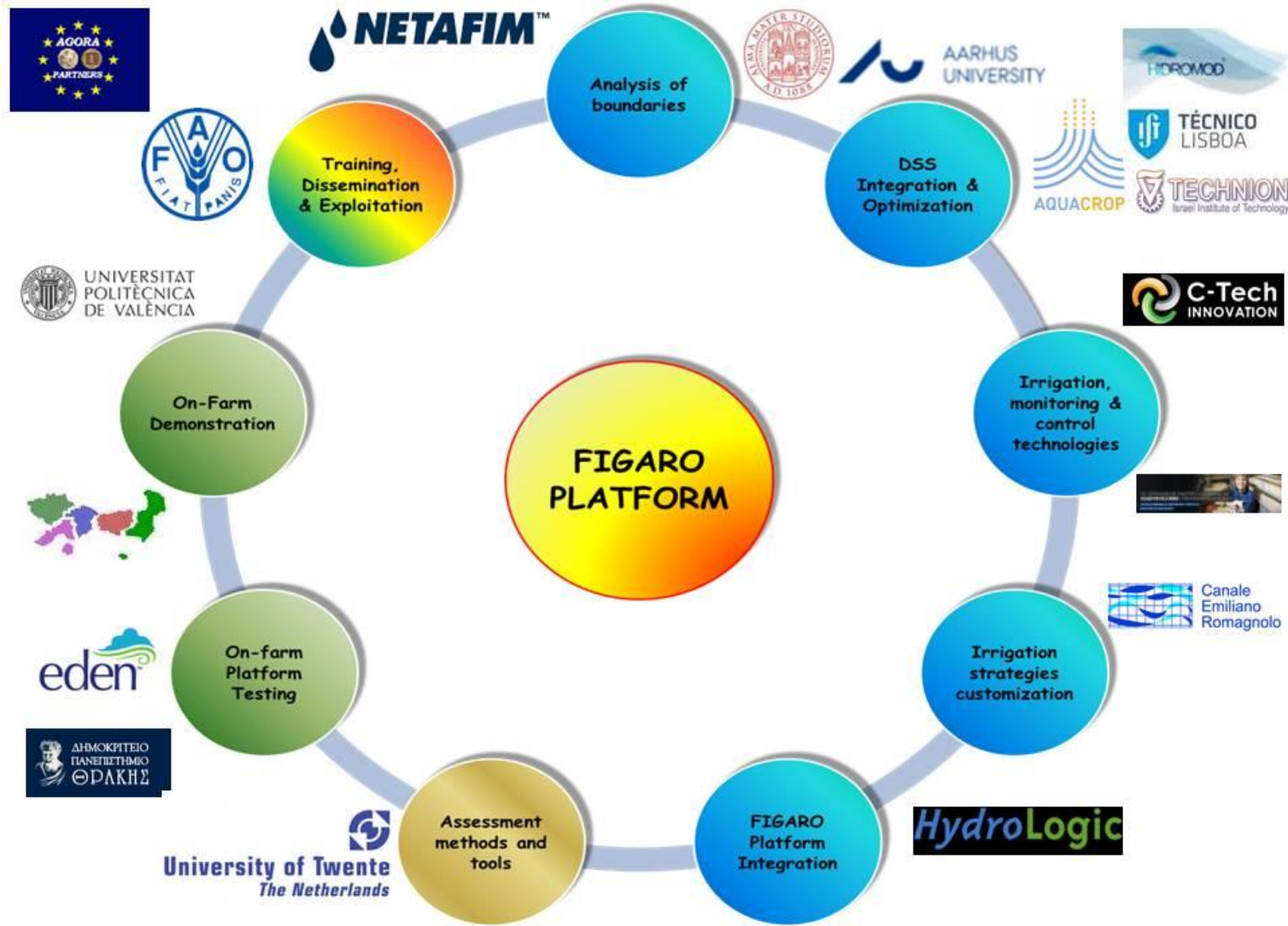


FIGARO Project in brief

- FP7 Project
 - Co-funded by the EU
- Industry-driven project
- 17 partners
 - Academic & Research Institutes
 - Industrial technology providers
 - Public Authorities
 - End-user representatives
- Duration of 48 months
- Website: <http://www.figaro-irrigation.net/>



Figaro Project Partnership



Project Objective

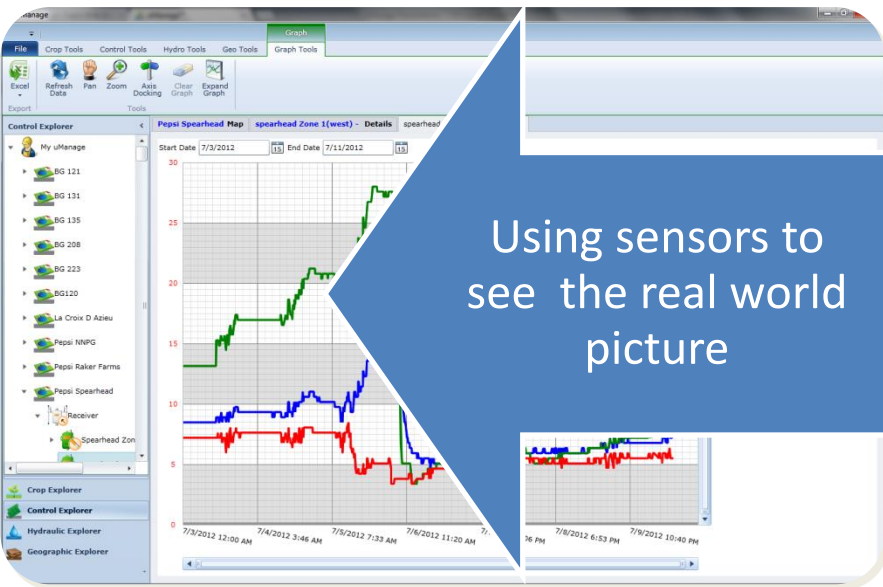
Significantly reduce the use of fresh water at farm level through the development of a cost-effective, precision irrigation management platform

- Structured for data acquisition from monitoring devices and forecasting tools, data interpretation, system control, and evaluation mechanisms
- Integrated with multiple state-of-the-art irrigation technologies and strategies

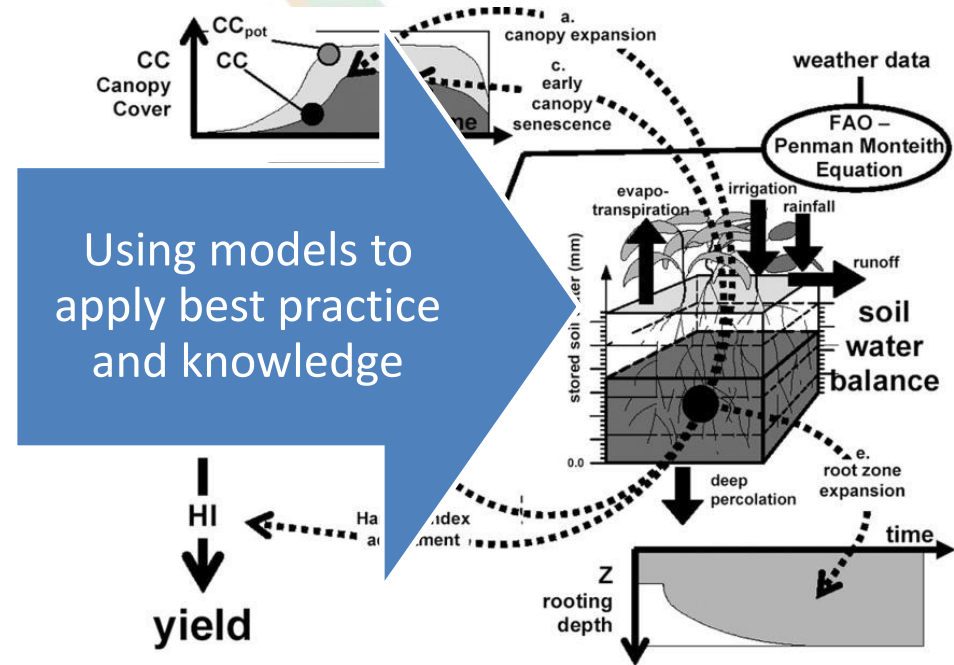


Problem Description

While most growers do not use any technology to improve crop management, the ones that do, take two different approaches



Using sensors to see the real world picture



Using models to apply best practice and knowledge

HI
↓
yield



Problem Description

Neither direction provides the growers what they need:
“a simple tool that helps irrigate correctly”

Sensors

- Not standard, different reliability and data accuracy
- Hard to translate the data to decision making
- Wide range of alternative sensors
- High cost investment

Crop models

- Too complicated to use
- Too specific for crop and region
- Not connected to the real world data
- Takes a lot of time to calibrate & optimize

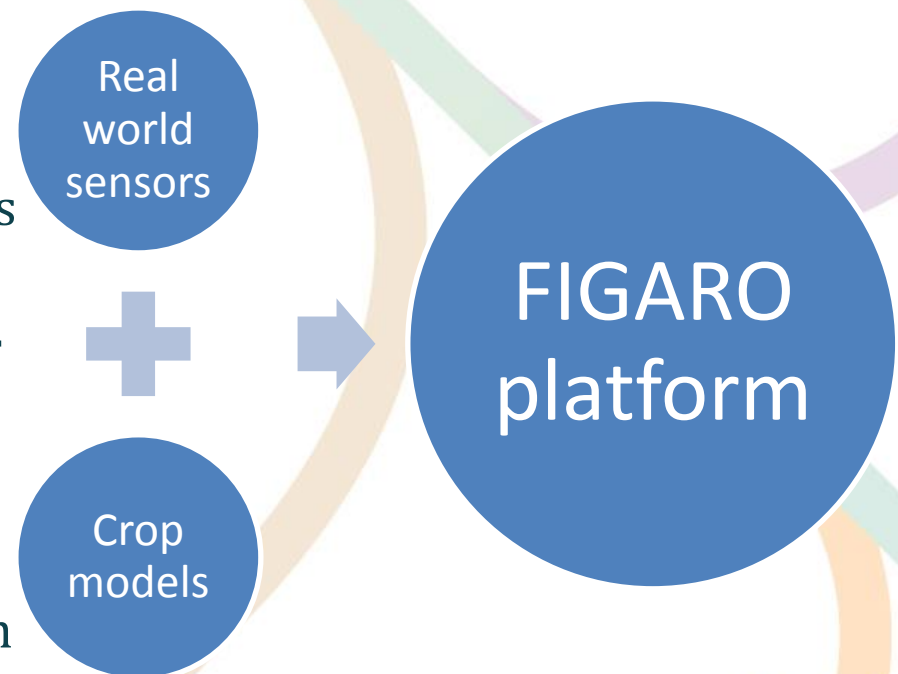


FIGARO Vission

Solution: feeding real world data into the crop models combined with an easy to use interface

FIGARO platform aims to:

- Combine proven models with proven sensor technology
- Provide easy maintenance & operation by automation of process & connection to actuators
- Be user friendly due to simple user interface and predefine data
- Open platform nature for local adaptation and setup
- Offer different levels of usage- from simple to complex



FIGARO Vission

The more usable the system is, the greater the impact

Immediate benefits should be:

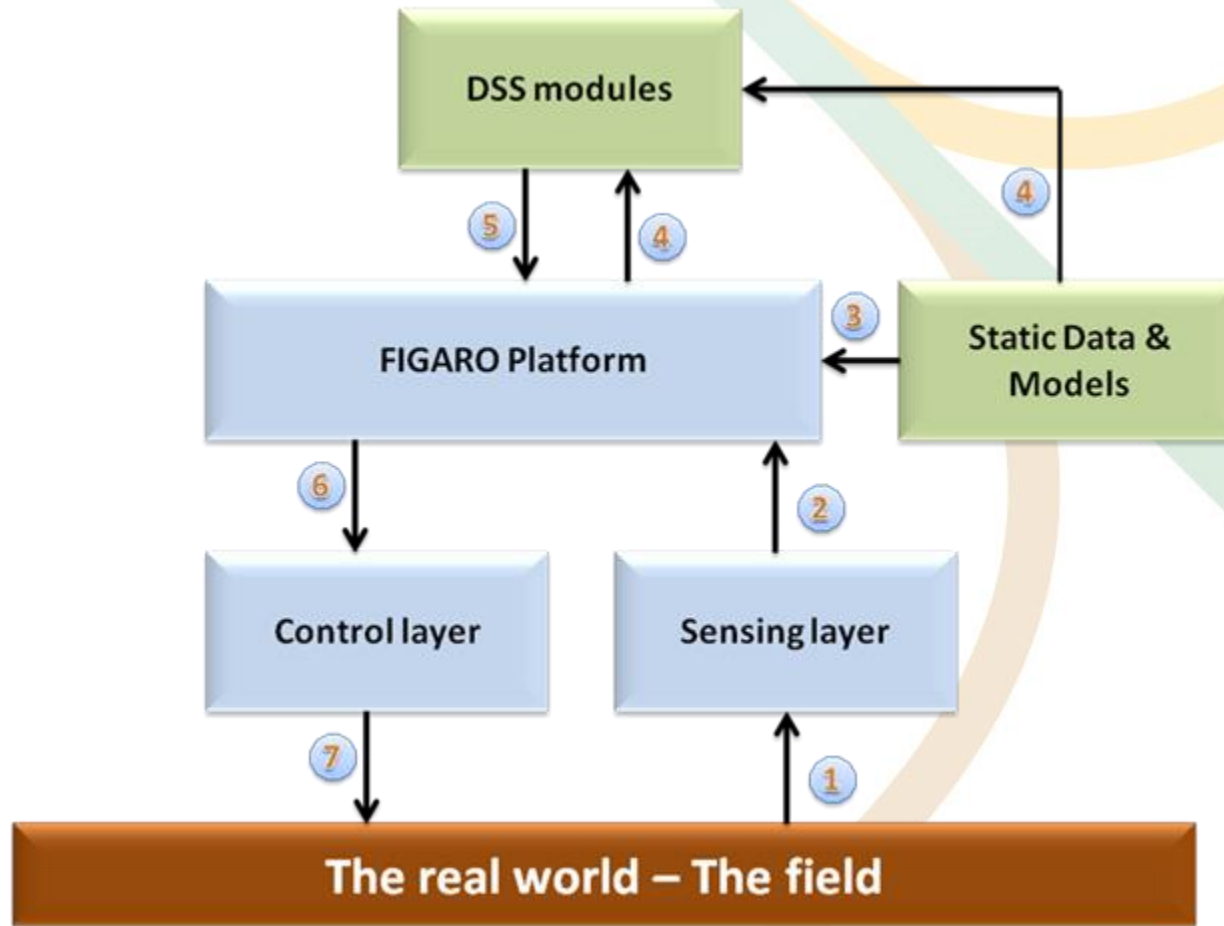
- Fresh water savings
- Fertilizers savings
- Improved yield quantity and quality

But some long term objectives will be achieved as well:

- Growers will know what is going on in their fields
- Growers will start using advanced tools to manage their crops
- Growers will adopt methodologies for better crop management



FIGARO System Architecture

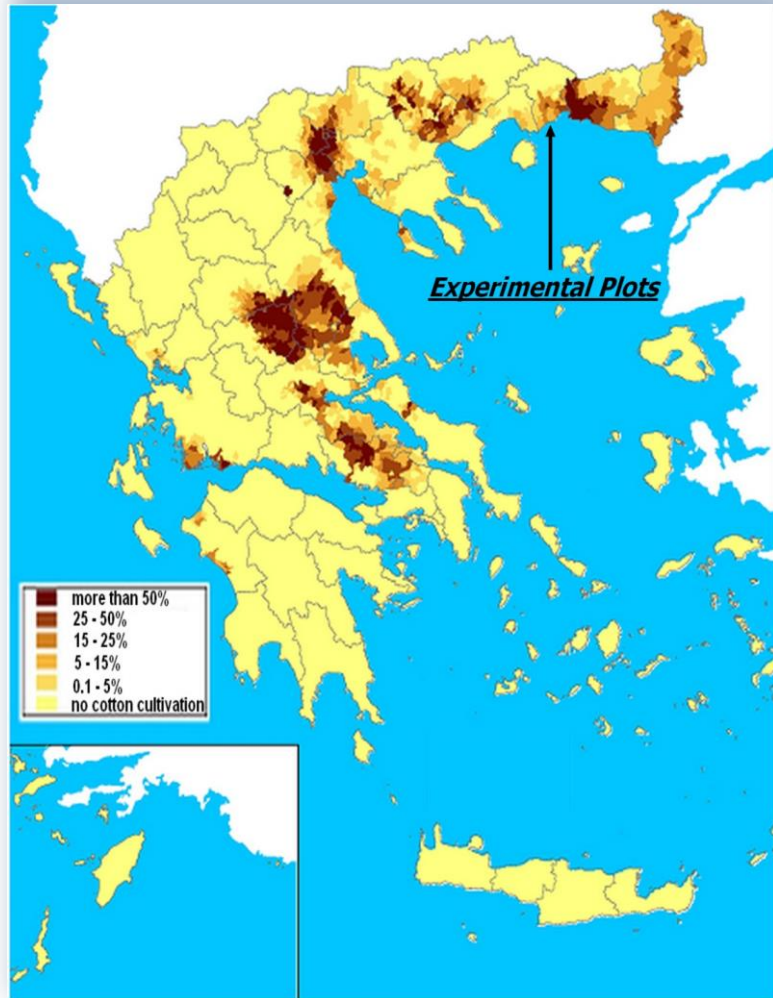


The Greek Experiment

A traditional cotton field located in Magiko,
Xanthi, N. Greece



Study area characteristics



Water District 12: Thrace

Climate: Mediterranean, humid subtropical climate

Crop targeted: Cotton

47,500 ha cultivated in WD12

Mean annual yield: 2.8-3.6 tn/ha

Irrigation types:

69% Sprinklers

21% Drip

7% Furrow

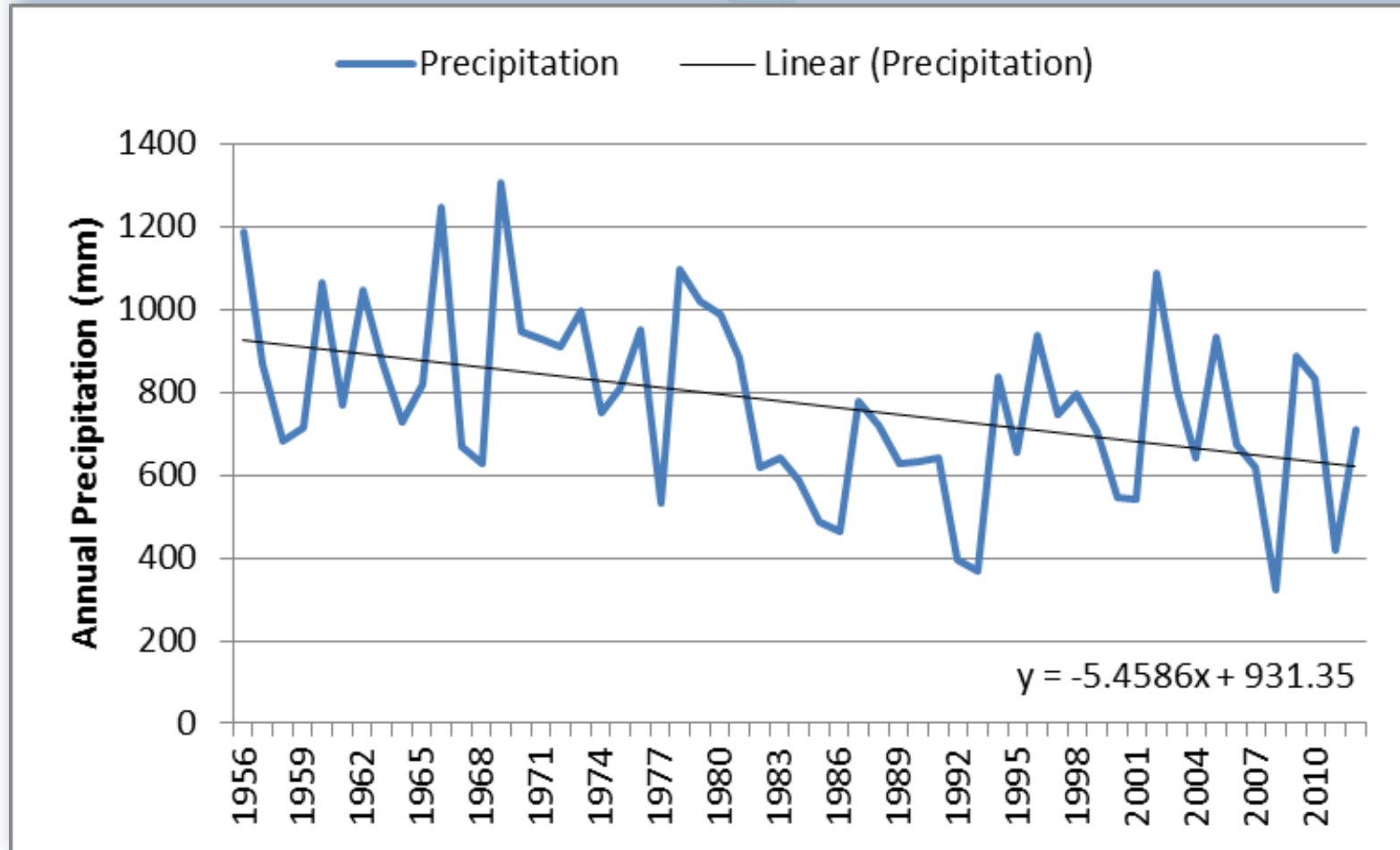
3% Rainfed

Agriculture utilizes 60% of water resources in WD12.

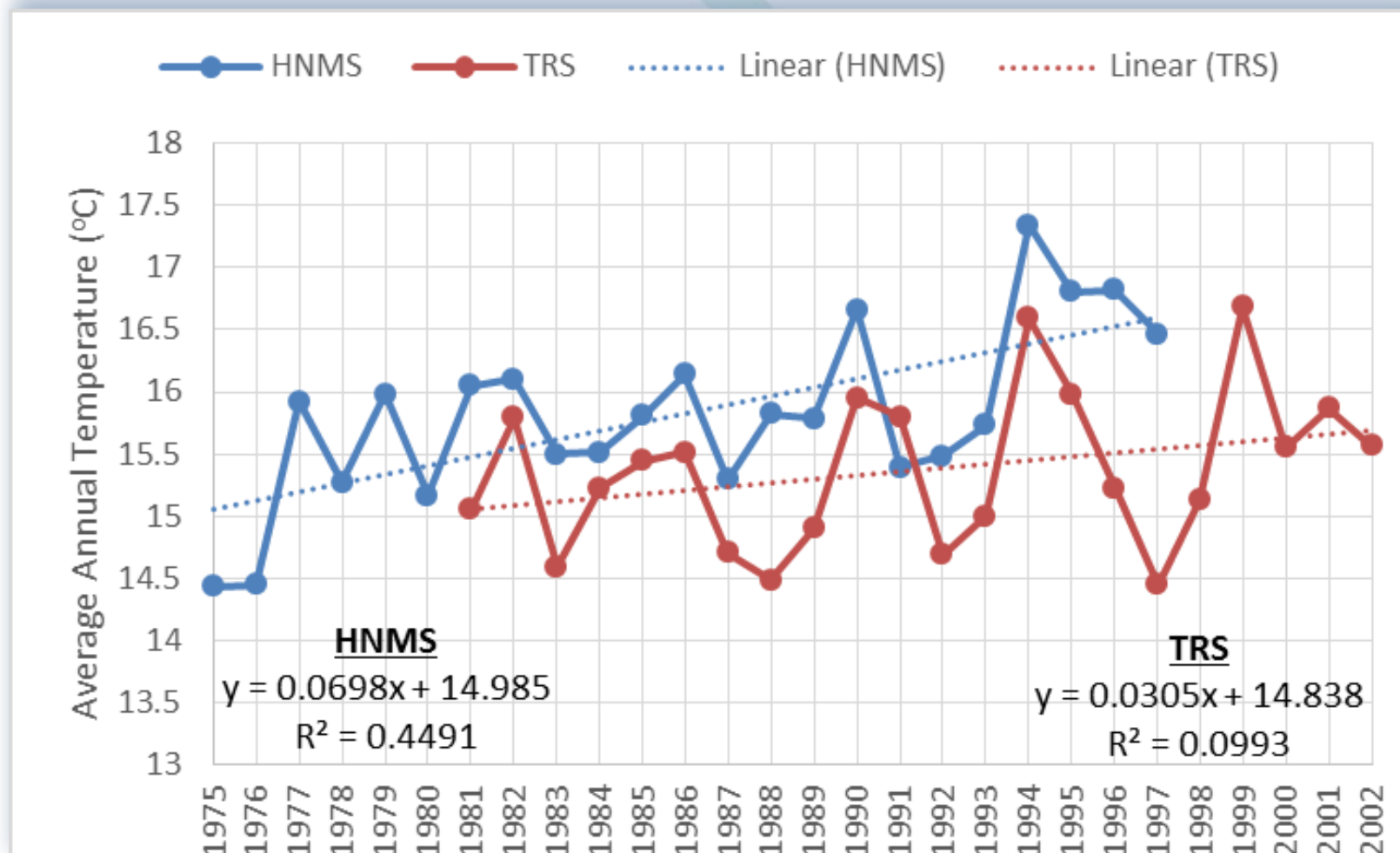
Farmers overuse water - No tariffs imposed



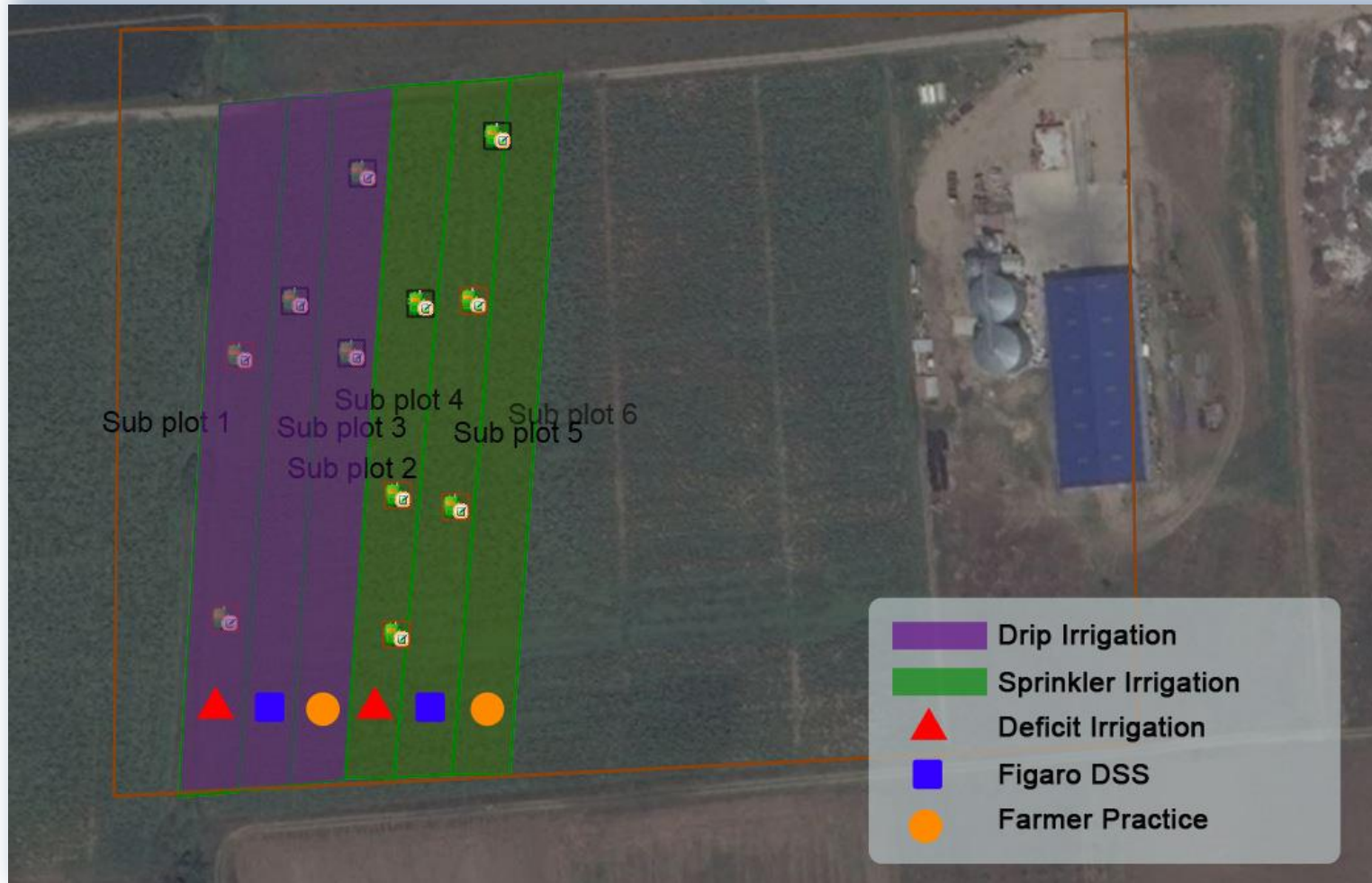
Is there a need to save irrigation water in WD12 - Thrace?



Is there a need to save irrigation water in WD12 - Thrace?



FIGARO experimental farm - Xanthi, WD12



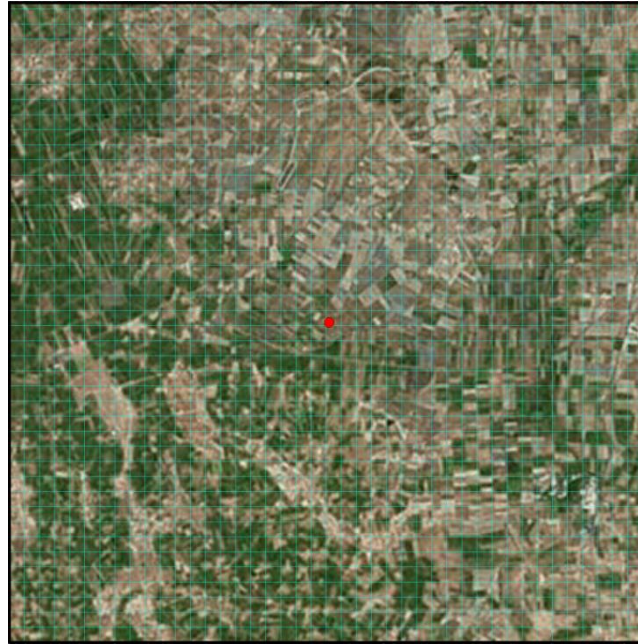
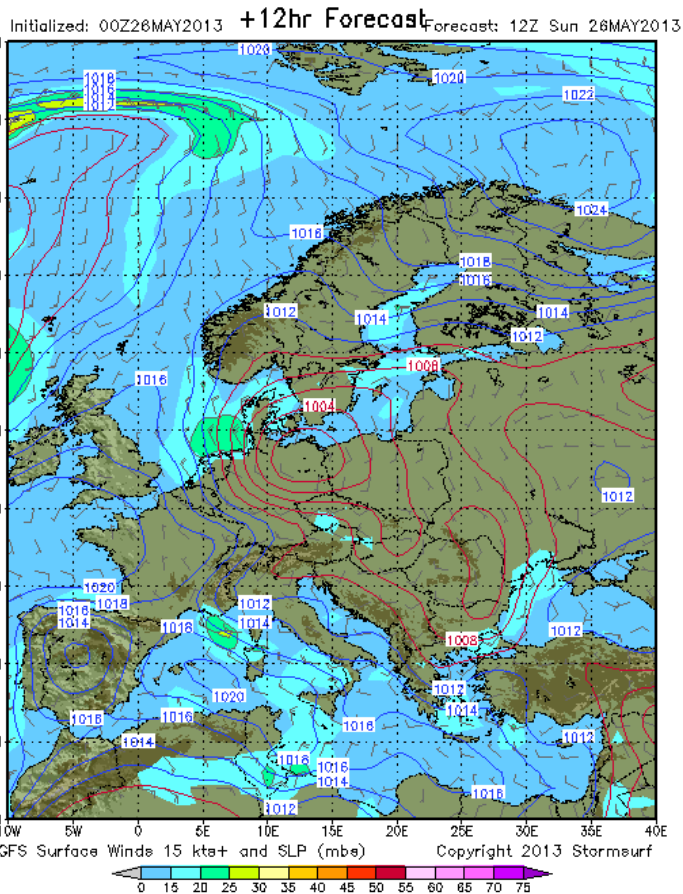
4 Steps for Precision Irrigation



Step 1:

- Textural soil analysis up to 1 m depth
- Field capacity, permanent wilting point and Saturated Hydraulic Conductivity per sample were determined
- Chemical soil analysis for fertigation requirements

4 Steps for Precision Irrigation



Step 2: Numerical simulation for local weather prediction within the next 48 hours, to locally forecast the precipitation height



4 Steps for Precision Irrigation



Step 3:

Based on the meteorological prediction we calculate the ET_0

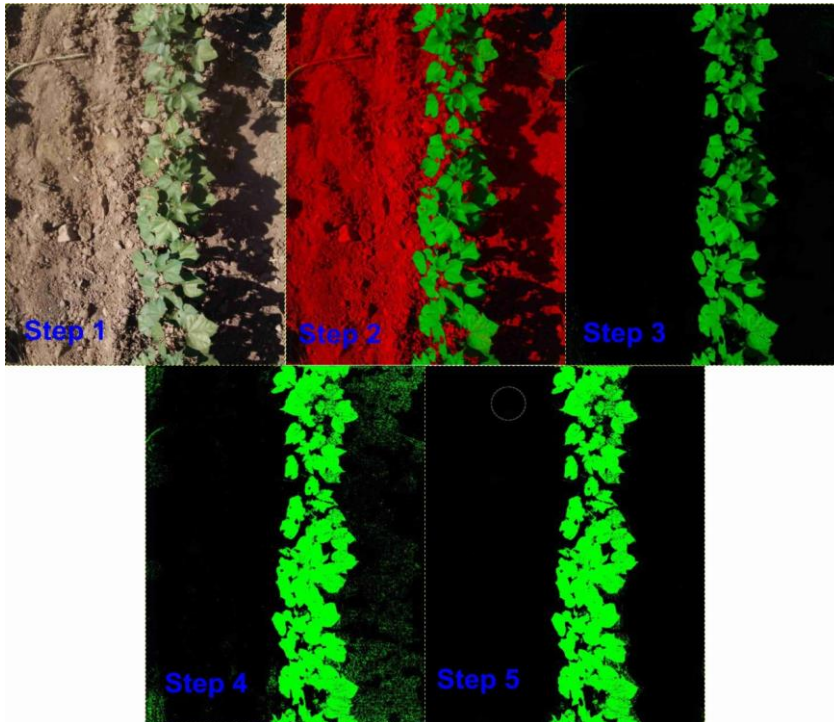
In parallel, a soil moisture sensors network measured soil moisture in real time at different sub-plots and depths



4 Steps for Precision Irrigation

Step 4:

- Crop growth rate measurements using SunScan for LAI and cell phone images for canopy cover

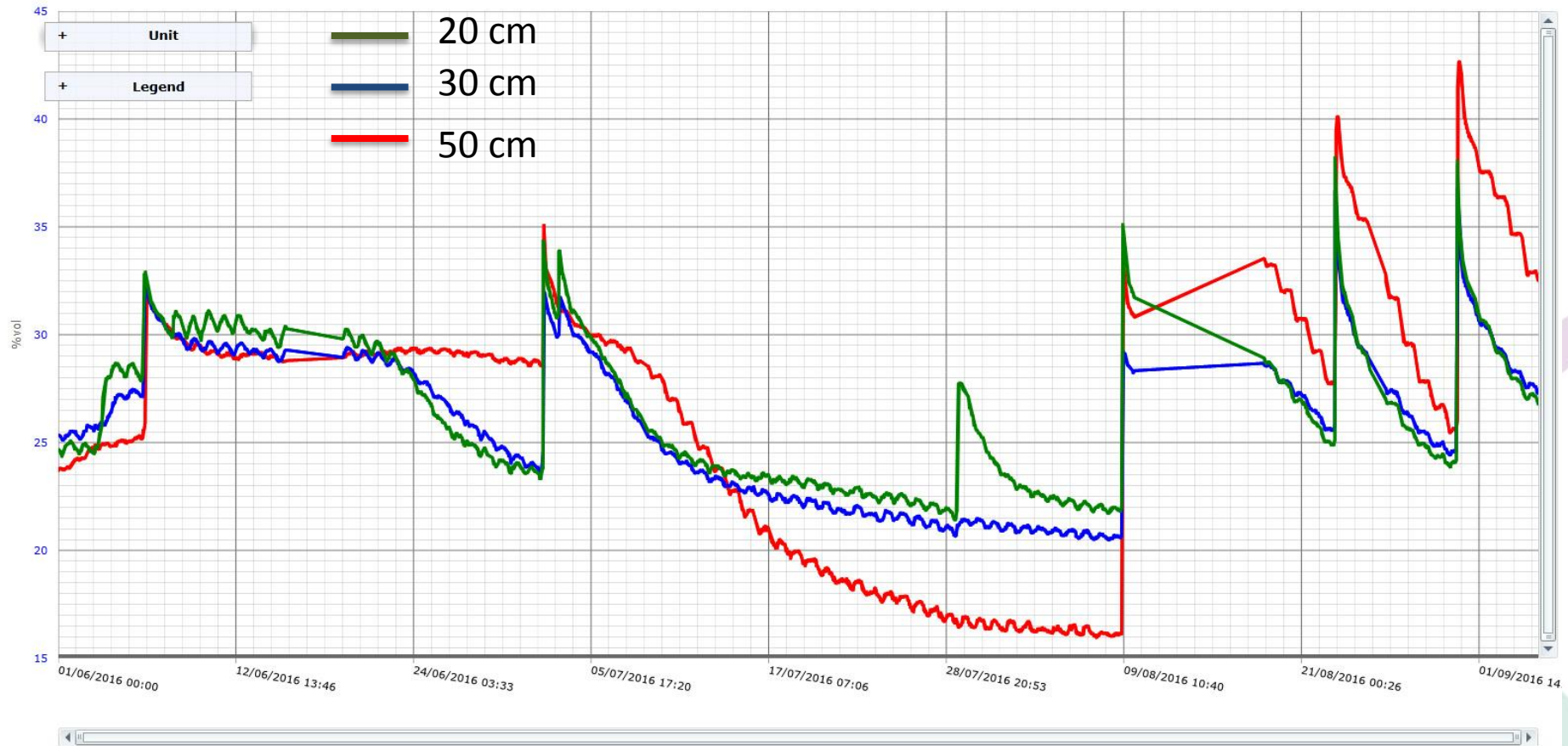


Sensors connected to FIGARO Platform

The screenshot displays the FIGARO web interface for a farm named "Greece (DUT)". The main view is an aerial map of the farm, with a yellow rectangular area highlighting a specific section. This section is divided into six vertical sub-plots, labeled "Sub plot 1" through "Sub plot 6". Various sensor icons are placed on the map, indicating the locations of connected sensors. The interface includes a top navigation bar with the FIGARO logo, a search bar, and a user profile section showing "Hello dutlg (Log Out)". A sidebar on the left lists the farm's structure, including "Greece (DUT)", "DUT 2015", "DUT 2016", and several plots (Plot1 to Plot6). The bottom of the interface features a weather and sensor status bar with icons for weather, irrigation, wind, and other sensors, along with their current values: 0 mm, 5,6 mm, 4 m/s, 220,2 deg, 927,3 W/m2, 28 degC, and 43,8 %.



FIGARO Platform in Action



FIGARO Irrigation Recommendation

Plot1, AQUACROP VIEW, Edit Irrigation Recommendation

	Δευ Σεπ05	Τρι Σεπ06	Τετ Σεπ07	Πεμ Σεπ08	Παρ Σεπ09	Σαβ Σεπ10	Κυρ Σεπ11
	20	0	0	0	0	0	0

Day	Recommended irrigation events	Farmer forecast
Δευ Σεπ05	20	0
Τρι Σεπ06	0	0
Τετ Σεπ07	0	0
Πεμ Σεπ08	0	0
Παρ Σεπ09	0	0
Σαβ Σεπ10	0	0
Κυρ Σεπ11	0	0

Save Cancel

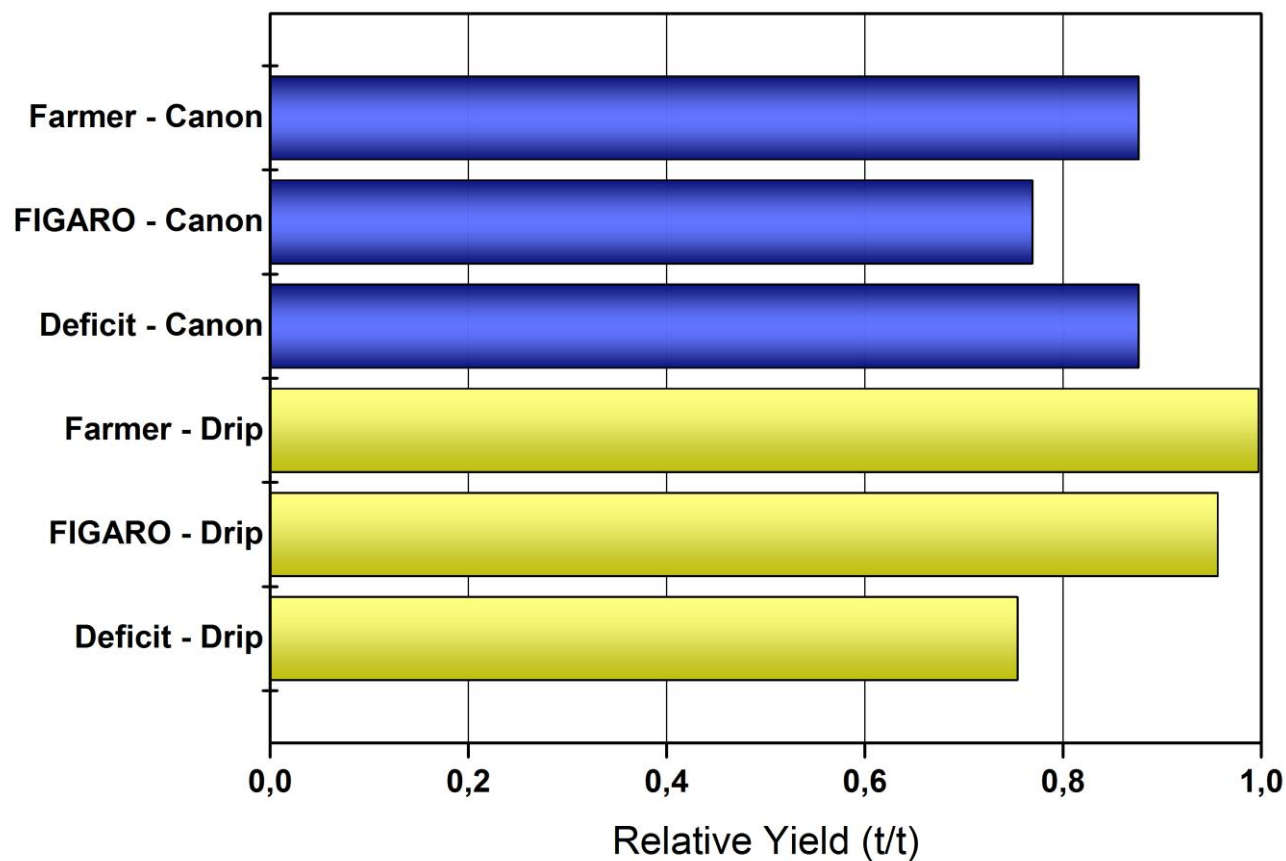


FIGARO Experimental Results - 2013

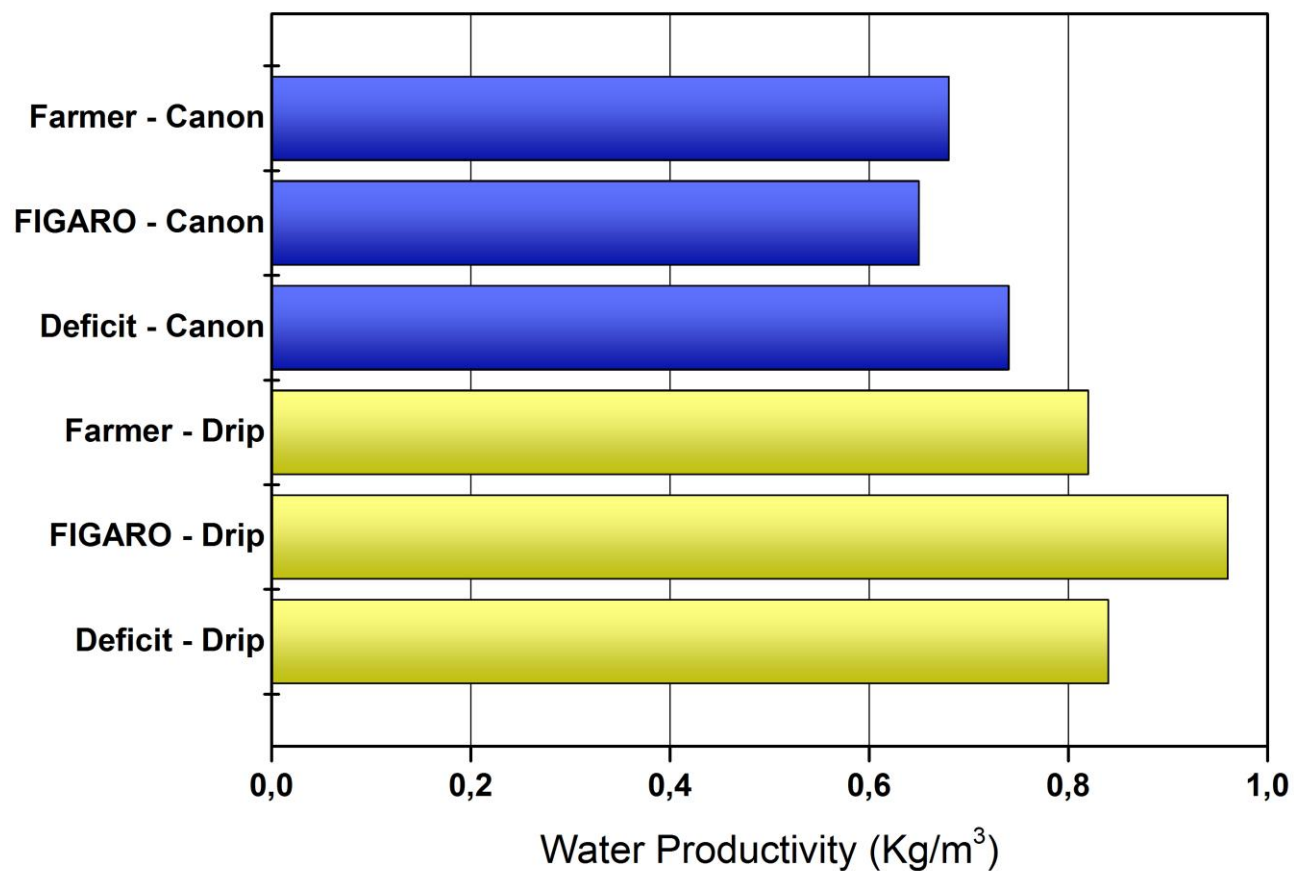
Treatment	Irrigation Method	Irrigation (m ³ /ha)	Real Seed Cotton Yield (tn/ha)			Estimated Seed Cotton Yield (tn/ha)
			1° pick	2° pick	Sum	
Deficit	Drip	2,270	3.03	0.364	3.40	4.253
FIGARO	Drip	2,710	3.64	0.667	4.30	4.521
Farmer	Drip	3,680	3.94	0.545	4.48	4.826
Deficit	Canon	3,410	3.21	0.73	3.94	3.775
FIGARO	Canon	3,510	2.85	0.61	3.46	3.775
Farmer	Canon	4,000	3.21	0.73	3.94	4.346



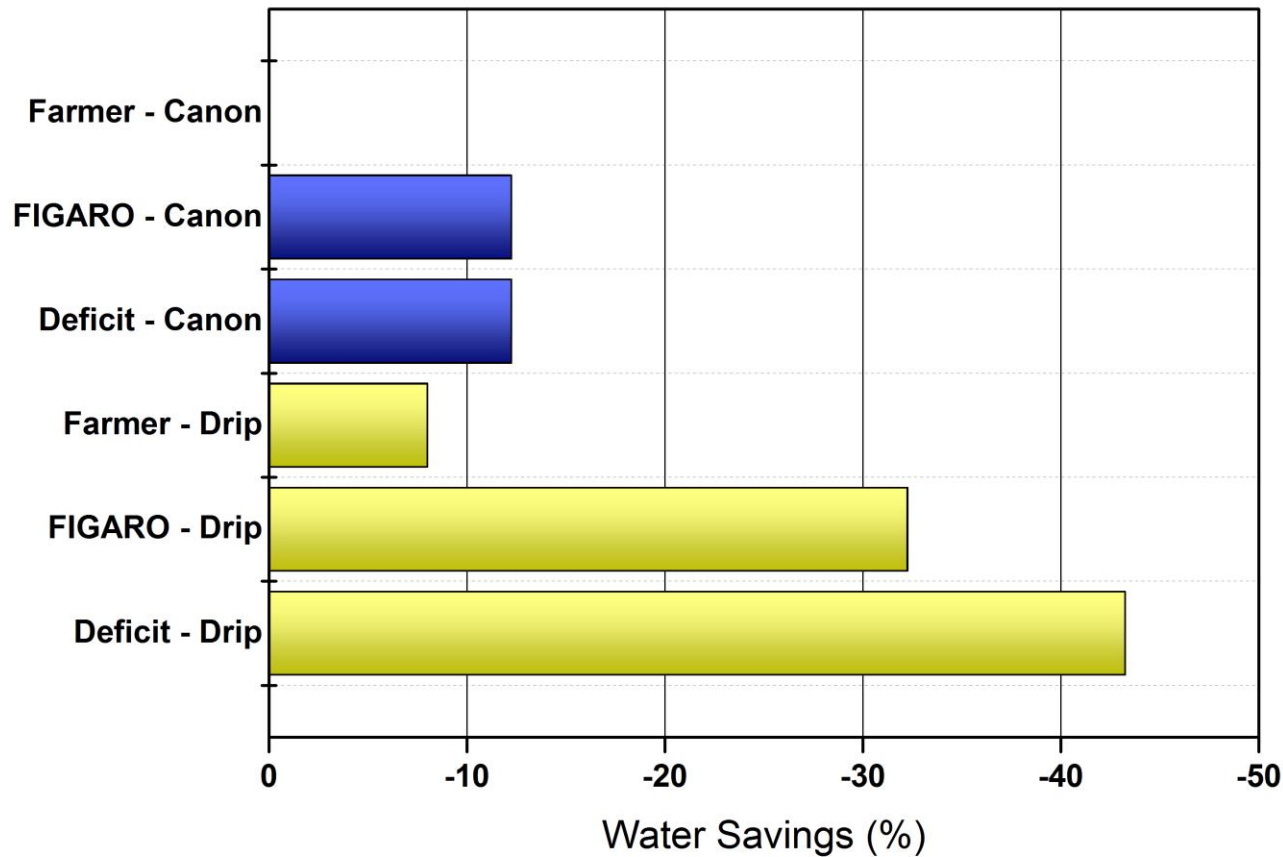
FIGARO Experimental Results - 2013



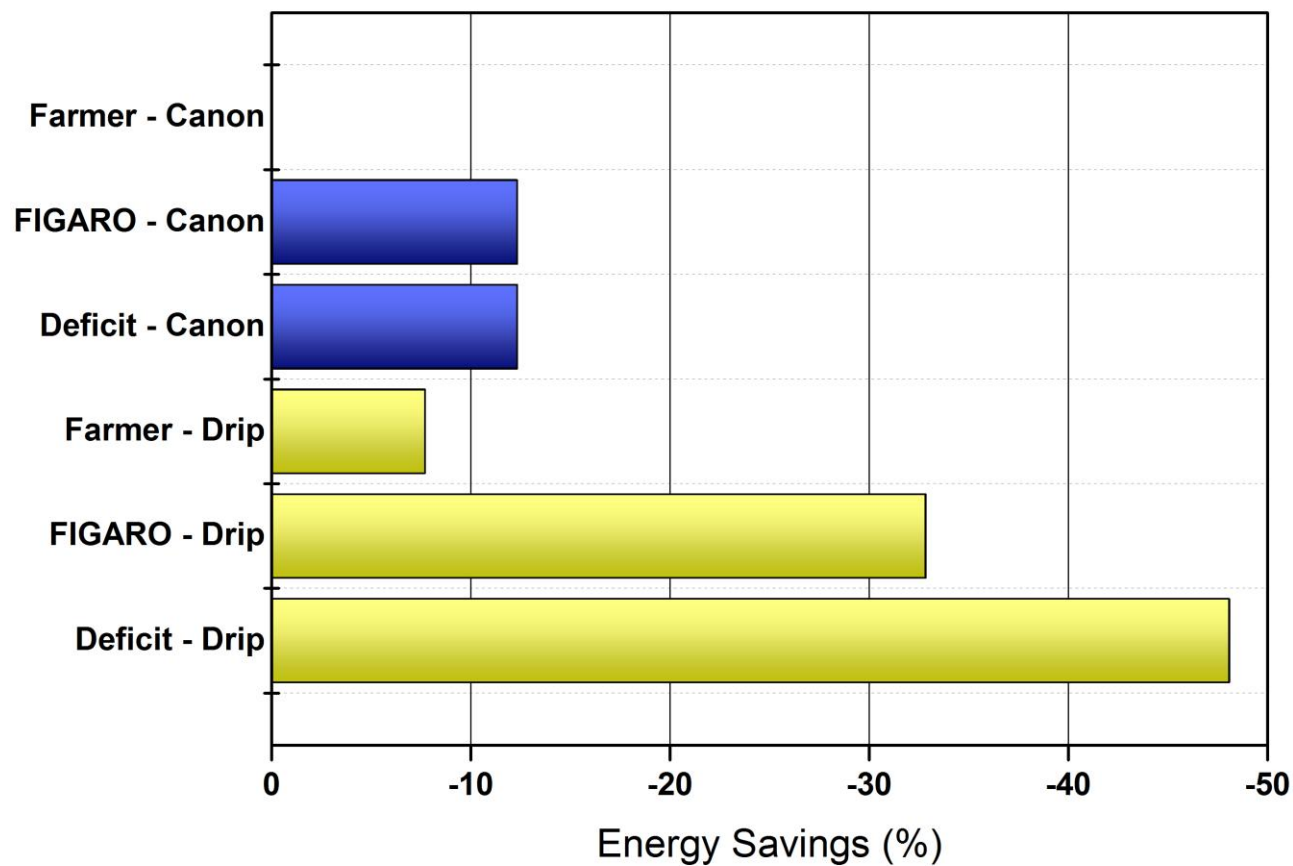
FIGARO Experimental Results - 2013



FIGARO Experimental Results - 2013



FIGARO Experimental Results - 2013



FIGARO Experimental Results - 2015

Treatment	Irrigation Method	Irrigation (m ³ /ha)	Real Seed Cotton		Estimated Seed Cotton Yield (tn/ha)
			Yield (tn/ha)		
			pick	SD	
Deficit	Drip	3,020	3.97	1.1	3.81
FIGARO	Drip	3,100	4.05	0.7	4.04
Farmer	Drip	3,100	3.40	0.6	3.68
Deficit	Canon	3,416	2.55	1.1	3.00
FIGARO	Canon	3,715	3.34	0.4	4.21
Farmer	Canon	4,383	3.24	0.2	4.81



FIGARO Experimental Results

	2013		2015	
	Yield (tn/ha)	Potential yield Increase (%)	Yield (tn/ha)	Potential yield Increase (%)
Regional Mean Yield	2.8		2.7	
FIGARO DRIP	4.3	53.6	4.04	49.6
FIGARO CANON	3.8	35.7	4.2	55.5

A potential average increase roughly $48.6\% \pm 9\%$ over the mean regional seed cotton yield



Results Dissemination at Local Level



- Five informative events targeting local farmers
- Two working sessions with regional policy stakeholders

- One Open Field Day
- Social Media campaign
- Information material

In close cooperation with Regional Union of Municipalities, REMTh (project partner)



Conclusions

FIGARO platform could stimulate transition from empirical to Precision Irrigation and ultimately to Precision Agriculture as a common practice in Greece by:

- Providing short term **irrigation recommendations**, improving the efficiency of farmer's irrigation scheduling
- **Reducing** cultivation costs **by reducing the energy** consumption required for pumping irrigation water
- **Increasing** substantially the regional **mean cotton seed production**, contributing to the local and regional growth of agricultural sector
- Helping Farmers, Agronomists and irrigation consultants to **create** local weather, soil and agricultural databases, to further understand and improve their practices





Thank you for your attention

