Operationalizing the increase of water use efficiency and resilience in irrigation (OPERA)

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Background

Extreme climatic events have negatively affected crop productivity in Europe and this is expected to further increase yield variability under climate change. Information is needed at when and where water shortage is to be expected. Recent decades provided large developments in sensors and models to analyse soil water dynamics. However there is a significant gap in applying the necessary combination of such techniques to predict upcoming water demands within a region over a time span of 10 to 15 days. OPERA will focus on best possible combinations of information technologies and develop innovative service models to realize a practical transition towards an increased use of precision irrigation (Figure 1).

Objectives

OPERA will strengthen farmers' adaptation to climate change and applies a transdisciplinary approach to identify jointly:

- How farmers and irrigation organizations can react more flexible to predicted water variability;
- Adequate combinations of soil and crop sensors, remote sensing, weather forecast and simulation models for better consideration of rainfall, evapotranspiration and soil moisture in irrigation scheduling;
- How to integrate experience in operationalizing precision irrigation from various climatic zones in Europe and South Africa to identify applicable service models for more robust decision making. On a larger scale, this information can be used to support drought management decisions.

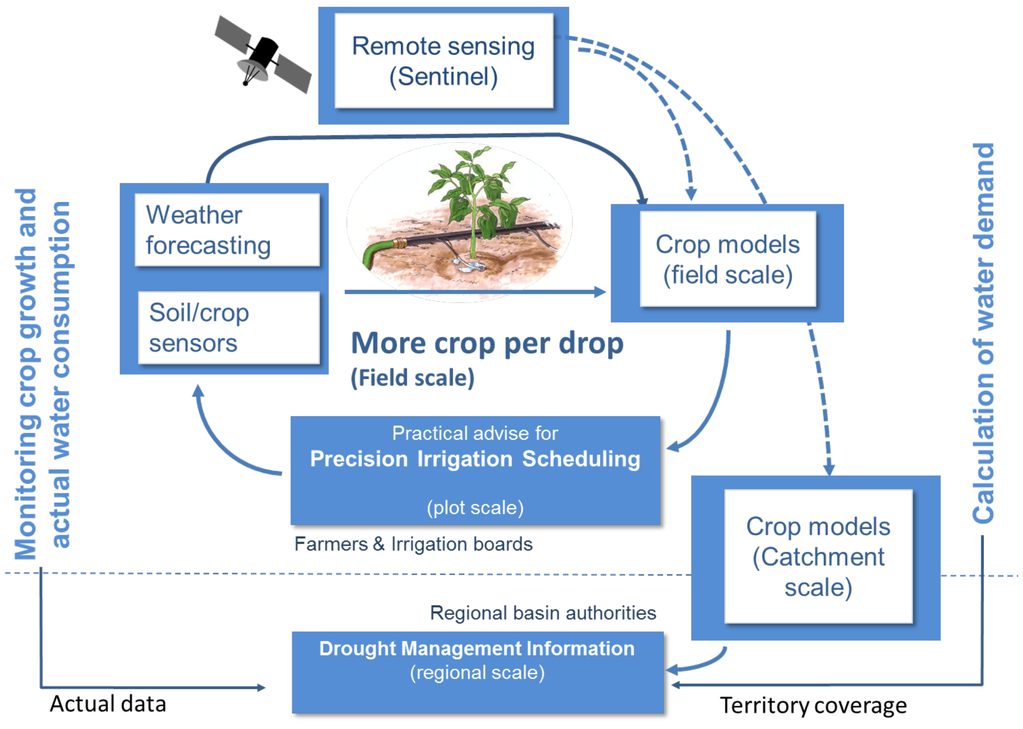

Figure 1. Linking weather, RS, in-situ crop and soil sensors, crop and soil models, and stakeholders to synthesize case study results in a concept for an operational support of precision irrigation at field scale and water saving at catchment scale

Current standings

WP1 Identifying sector needs to increase resource use efficiency (Evenor, Spain)

- Workshops/interviews with stakeholders: identifying sector needs. All used same questionnaires.
- Cooperation with WP4 (Figure 2)

WP2 Forecasting water availability and critical water demand (INRA – EMMAH, France)

- Six methods are being studied; focus on using models to better assess soil water content, remote sensing to characterize the vegetation status and take profit of the new capabilities of the recent satellite missions, and ensemble weather forecasts to account for uncertainties of this meteorological forecast (Figure 3)
- Cooperation with WP3

WP3 Guidance for optimal irrigation water strategies (case studies) (ITP, Poland)

- Local application/testing of methods (see WP2) in field studies in PL, NL, SP, FR, IT
- Cooperation with WP2 (Figures 4, 5)

WP4 Conceptualization of practical service models for irrigation (CREA/UniFI, Italy)

- Workshops/interviews with stakeholders: towards practical service models for irrigation
- Cooperation with WP1 (Figure 2)

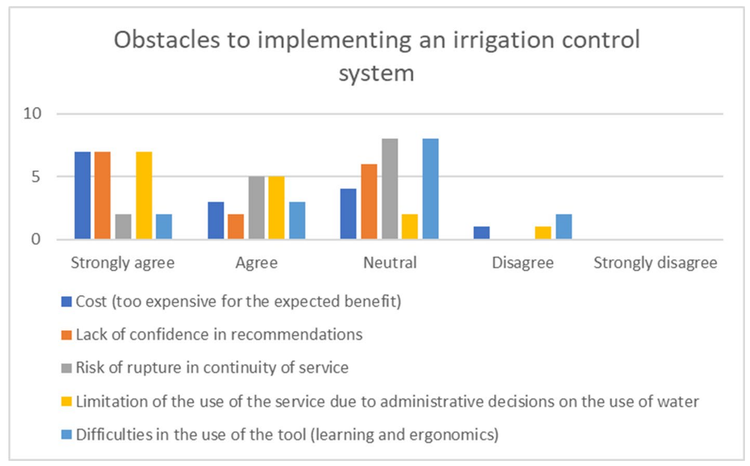

Figure 2. Example output from stakeholder analysis.

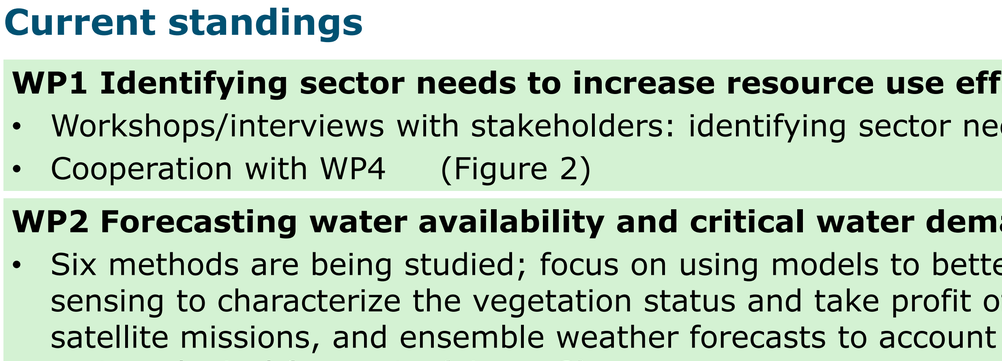

Figure 3. Example of method: prediction (modelled; red line) of water content in root zone (left) based on ensemble weather forecast (example: rain, right).

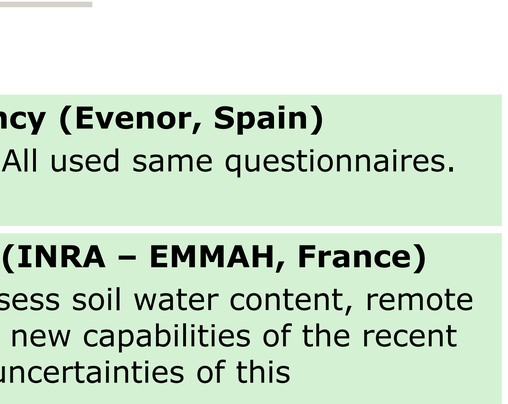

Figure 4. Case study site in Seville, Spain.

Figure 5. Case study sites in Europe and South Africa.

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