

Project acronym

FLOW-AID

Project title

Farm Level Optimal Water Management:
Assistant for Irrigation under Deficit

Start and end date

1/10/2006 - 31/12/2009

Funding programme

FP6

The overarching topics the project addresses:

- 7. Monitoring and analysis
- 13. Automation and e-techniques
- 16. Irrigation

A short summary of the project:

Agriculture is the largest user of water in the world. Irrigation water use efficiency must be increased drastically to secure food production for future generations, in other words: we need 'more crop per drop'. The general approach is to avoid water loss and to ensure that all irrigation water is being utilized by the crop. However, in many cases this is not enough. Water shortage forces growers to irrigate with lesser water or water of a lower quality. Working under such deficit conditions means that the grower needs to operate his water management more precisely to prevent income losses. This may also reduce nutrient leaching, one of the major aims of the Water Framework Directive.

In the FLOW-AID project, scientists of universities and research stations have co-operated with engineering companies to develop new systems and technologies for irrigation and drainage. The program has now resulted in innovative sensor technologies, which are integrated into a grower decision support system. The system has been evaluated and demonstrated at sites located in Lebanon, Jordan, Turkey, Italy, the Netherlands and Spain.

The case studies have shown that the introduction of innovative technologies may raise water use efficiency by up to 60% while maintaining existing crop yields. The use of fertilizers may be reduced by up to 30%, which reduces costs and saves the environment. It has been shown that in fact yields often increase thanks to the new water management system. Growers might use this extra income for investments in new technologies.

The main objectives of the project:

The main objective of this project is to contribute to sustainability of irrigated agriculture by developing, testing in relevant conditions, and fine-tuning through feed-back, an irrigation management system that can be used at farm level in those situations where there is a limited water supply and water quality.

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The system can also serve as an assistant for communication with higher level water management systems at basin scale for long and short term water use planning and prediction. This project integrates innovative sensor technologies into a decision support system for irrigation management, taking into consideration relevant factors in a number of third country partners. The involvement of SME's in the development ensures a fast application of the results.

The specific targets are:

1. Sensor technology (hardware): Develop and test new and innovative, but simple and affordable, technical concepts for irrigation under deficit conditions, that can be used at farm level in a large variety of set-ups and constraints, particularly:

WP1: Innovative monitoring tools (dielectric solid-state tensiometer).

WP2: Wireless, low-power data networks.

2. Decision support (software): Develop a water management decision support system (DSS) that contains:

WP3: Expert system (off-line/long-term) to assist in farm zoning and crop plan, in view of expected water availability (amount and quality), with link to Basin Management.

WP4: A crop response module that can be incorporated into the irrigation scheduler.

WP5: Irrigation scheduling (on-line/short-term) module that allocates available water(s) among several plots and schedules irrigation for each one, with link to Basin Management.

3. Calibrate in view of relevant factors: Set-up 4 test-sites in various market conditions, with different irrigation structures, crop types, local water supplies and constraints. Adapt the general concept of water management to the local situation by using appropriate parts of it, and integrate and test this hard- and software at the test-site.

WP6: Test site in Lebanon.

WP7: Test site in Jordan.

WP8: Test site in Turkey.

WP9: Test site in Italy.

Dissemination activities and events planned within the project:

Project activities are finished.

Link to EU water policy:

1. Water Framework Directive

10. Water Scarcity and Drought Policy

The project is focused to these stakeholders:

2. Research sector

3. Policy sector

4. Private sector – business

5. End users and General public

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The main results the project already achieved:

Industry and SME's may take up the following research results to build new hardware and software for deficit irrigation systems:

1. Low-cost sensor and controller technology: a solid-state tensiometer; a wireless, low-power sensor network for soil moisture and EC sensors; an irrigation controller for optimal irrigation scheduling.
2. A Decision Support (Expert) System to assist in farm zoning and crop planning, in view of expected water availability (amount and quality); a crop response model for deficit irrigation; and a deficit irrigation scheduling module that allocates available water(s) among several plots.

The SME partner's involvement already ensures that the results will be implemented in a short time into appropriate products for the end-user irrigation market. The participation of the Mediterranean test-sites ensures that the final products will also be fine-tuned to the [economic and physical] conditions of non-European markets, where the largest growth for irrigation equipment is expected.

Case studies have shown that compared to current practices, by using innovative technologies, the water use efficiency can be raised up to 10% while maintaining the existing crop yields. Application of new technologies cost money. Some case studies have shown that by using technology and adapting strategies one could even raise the productivity up to 10%, while the amounts of water and nutrients being used were less than current practices. By using treated waste water farmers could benefit from the already available nutrients in these water sources.

The main deliverables, available dissemination material and education material from the project:

- 1 policy brief (Science and Technology for Efficient Irrigation - Tools for growers to cope with water scarcity and the Water Framework Directive)
- 7 technology briefs (A new sensor to measure matric potential: The dielectric tensiometer; Wireless sensor systems for irrigation management: High density measurement of soil moisture, EC and temperature; A Crop Planning and Farm Zoning Tool; Crop stress response model: Assessment of crop yield response to water and salinity stress; Optimal management of irrigation under scarcity: A decision support system, description and working of the system; Sensor activated Irrigation Controllers: Precise management of irrigation water to minimise environmental damage & wastage; Sensor Activated Fertigation Controllers: Managing fertigation and dual water irrigation in container crops)
- 5 case study results (LEBANON: Optimizing Farm Water management Using Smart Irrigation Controller: Field grown eggplants under different irrigation regimes; JORDAN: Irrigation strategy with dual quality water: Irrigation with Fresh and Treated Wastewater under full and deficit soil moisture conditions for Tomato Crop; TURKEY: More yield, less water and less leaching: Minimization of leaching for cucumber grown in greenhouses under mild winter conditions; ITALY: Dual Water Irrigation of Pot Ornamentals: Saving water resources in ornamental nursery industry; THE NETHERLANDS: More yield, more quality and less emission of nitrate: Soil grown Iceberg lettuce under rain-fed conditions.)

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Contacts

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Organisations in the consortium

Name of institution	Country	Type of institution	Role
Wageningen University & Research Center, Greenhouse Horticulture	NL	Research Institute	Coordinator
Rothamsted Research	UK	Research institute	Partner
University of Castilla La Mancha, Regional Center of Water Research	ES	University	Partner
University of Pisa, Dipartimento di Biologia delle Piante Agrarie	IT	University	Partner
Ege University Faculty of Agriculture, Dept. of Agric. Structure and Irrigation	TR	University	Partner
Jordan University of Science and Technology, Faculty of Agriculture	JO	University	Partner
Lebanese Agricultural Research Institute, Department of Irrigation and Agro-Meteorology	LB	Research institute	Partner
Delta-T Devices Ltd.	UK	Private sector (SME)	Partner
Geomations S.A.	GR	Private sector (SME)	Partner
Spagnol Srl	IT	Private sector (SME)	Partner