A general algorithm for automated scheduling of drip irrigation in tree crops

Title	A general algorithm for automated scheduling of drip irrigation in tree crops
Title (native language)	
Category	- Reacting or variable rate technology - Farm Management Information System
Short summary for practitioners (Practice abstract) in English	Judicious irrigation necessitates development of technologies that apply the precise amount of water demanded by crops. The goal is to schedule irrigation according to the particular requirements of each orchard and to the variability encountered during the season caused by weather conditions, canopy development and other factors. For supporting a precise and low labour management of irrigation here we propose and depict an algorithm that coordinates seven automatable tasks: (1) estimation of irrigation needs, (2) adaptation to a particular irrigation setup, (3) execution of the schedule, (4) soil and/or plant monitoring, (5) interpretation of sensor data, (6) reaction to occasional events and (7) tuning the model of irrigation needs. This is illustrated with three examples from a peach orchard where a software tool implementing the algorithm was configured to manage irrigation under different strategies. They included two alternative methods for estimating the crop water needs: a typical water balance based on reference evapotranspiration (ETo) and a variation based on the measurement of solar radiation intercepted by the canopy. They also included two types of sensors for feedback: soil water probes and dendrometers, the latter for applying regulated deficit irrigation.
Short summary for practitioners	
Website	
Audiovisual material	

Links to other websites	
Additional comments	
Keywords	Water management | Energy management
Additional keywords	Irrigation scheduling; Precision irrigation; Autonomous control; Crop coefficient; Trunk diameter fluctuations
Geographical location (NUTS)	EU
Other geographical location	
Cropping systems	Tree crops
Field operations	Irrigation
SFT users	Farmer | Contractor
Education level of users	All
Farm size (ha)	0-2 | 2-10 | 10-50 | 50-100 | 100-200 | 200-500 | >500

Scientific article

Title	A general algorithm for automated scheduling of drip irrigation in tree crops
Full citation	Casadesús, J.; Mata, M; Marsal, J.; Girona, J. (2012). Computers and Electronics in Agriculture, DOI:10.1016/j.compag.2012.01.005

Effects of this SFT

Productivity (crop yield per ha)	Some increase
Quality of product	No effect
Revenue profit farm income	Some increase
Soil biodiversity	No effect
Biodiversity (other than soil)	No effect
Input costs	No effect
Variable costs	No effect
Post-harvest crop wastage	No effect
Energy use	Some decrease
CH4 (methane) emission	No effect
CO2 (carbon dioxide) emission	No effect
N2O (nitrous oxide) emission	No effect
NH3 (ammonia) emission	No effect
NO3 (nitrate) leaching	No effect
Fertilizer use	No effect
Pesticide use	No effect
Irrigation water use	Large decrease
Labor time	Some decrease
Stress or fatigue for farmer	No effect
Amount of heavy physical labour	No effect
Number and/or severity of personal injury accidents	No effect
Number and/or severity of accidents resulting in spills property damage incorrect application of fertiliser/pesticides etc.	No effect
Pesticide residue on product	No effect
Weed pressure	No effect
Pest pressure (insects etc.)	No effect
Disease pressure (bacterial fungal viral etc.)	No effect

Information related to how easy it is to start using the SFT

This SFT replaces a tool or technology that is currently used. The SFT is better than the current tool	agree
The SFT can be used without making major changes to the existing system	agree
The SFT does not require significant learning before the farmer can use it	agree
The SFT can be used in other useful ways than intended by the inventor	no opinion
The SFT has effects that can be directly observed by the farmer	agree

Using the SFT requires a large time investment by farmer	disagree
The SFT produces information that can be interpreted directly	no opinion

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