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Development of an autonomous early warning system for Bactrocera dorsalis (Hendel) outbreaks in remote fruit orchards

Title	Development of an autonomous early warning system for Bactrocera dorsalis (Hendel) outbreaks in remote fruit orchards
Title (native language)	
Category	• Farm Management Information System
Short summary for practitioners (Practice abstract) in English)	In this study, an autonomous early warning system, built upon the basis of wireless sensor networks and GSM networks, is presented to effectively capture long-term and up-to-the-minute natural environmental fluctuations in fruit farms. In addition, two machine learning techniques, self-organizing maps and support vector machines, are incorporated to perform adaptive learning and automatically issue a warning message to farmers and government officials via GSM networks when the population density of B. dorsalis significantly rises. The proposed system also provides sensor fault warning messages to system administrators when one or more faulty sensors give abnormal readings to the system. Then, farmers and government officials would be able to take precautionary actions in time before major pest outbreaks cause an extensive crop loss, as well as to schedule maintenance tasks to repair faulted devices.
Short summary for practitioners	
Website	
Audiovisual material	
Links to other websites	
Additional comments	

Keywords	Plant production and horticulture
Additional keywords	Agricultural management; Oriental fruit fly; Pest monitoring; Early warning system; Wireless sensor networks
Geographical location (NUTS)	EU
Other geographical location	Global
Cropping systems	Tree crops
Field operations	Crop protection | Crop and soil scouting
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	Development of an autonomous early warning system for Bactrocera dorsalis (Hendel) outbreaks in remote fruit orchards
Full citation	Liao, M.-S.; Chuang, C.-L.; Lin, T.-S.; Chen, C.-P.; Zheng, X.-Y.; Chen, P.-T.; Liao, K.-C.; Jiang, J.-A. (2012). Computers and Electronics in Agriculture, DOI:10.1016/j.compag.2012.06.008

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	Some decrease
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	Large decrease
Irrigation water use	No effect
Labor time	Some decrease
Stress or fatigue for farmer	Large decrease
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.	Some decrease
Pesticide residue on product	Some decrease
Weed pressure	No effect
Pest pressure (insects etc.)	Some decrease
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	no opinion
The SFT does not require significant learning before the farmer can use it	strongly 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	agree

View this technology on the Smart-AKIS platform

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