

## The application of Smart Technologies in agriculture for pest monitoring and control

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Smart farming and Agriculture 4.0 are new concepts emerged in recent years concerning the way agricultural goods are produced. They give greater attention to innovative approaches such as precision agriculture, Internet of Things (IoT) and the use of big data. These tools are used for tracking, monitoring, automating and analyzing operations through the extensive use of sensors in the field to collect information and in-silico approaches to elaborate them, as is case of decision support systems (DSS), which provide suggestions to end users for optimising cultivation processes.

In the present contribution, smart applications for the monitoring and pest control of two fruit flies, *Bactrocera oleae* Rossi and *Ceratitis capitata* Wiedemann, are illustrated. Examples of IoT applied to the monitoring of fruit flies are the automatic traps. These are equipped with a camera that collects images of the insects glued on adhesive panel and sends them to a remote server. Flies can be counted by visual observation of the image or an artificial intelligence-based algorithm that correctly recognize them. Precision targeting applications of pest control are also presented, which includes farm digitization; specific DSS for each fruit fly, which create risk maps to make insecticidal treatments precise in time and space; a module to guide the operator in the field during treatments; web application that returns inputs and outputs to be visualized and managed.

The incorporation of such an innovative technology into integrated pest management (IPM) practices will provide to end users' broad benefits, including a better control of agricultural processes to reduce production inputs, such as chemicals, and labor costs.

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