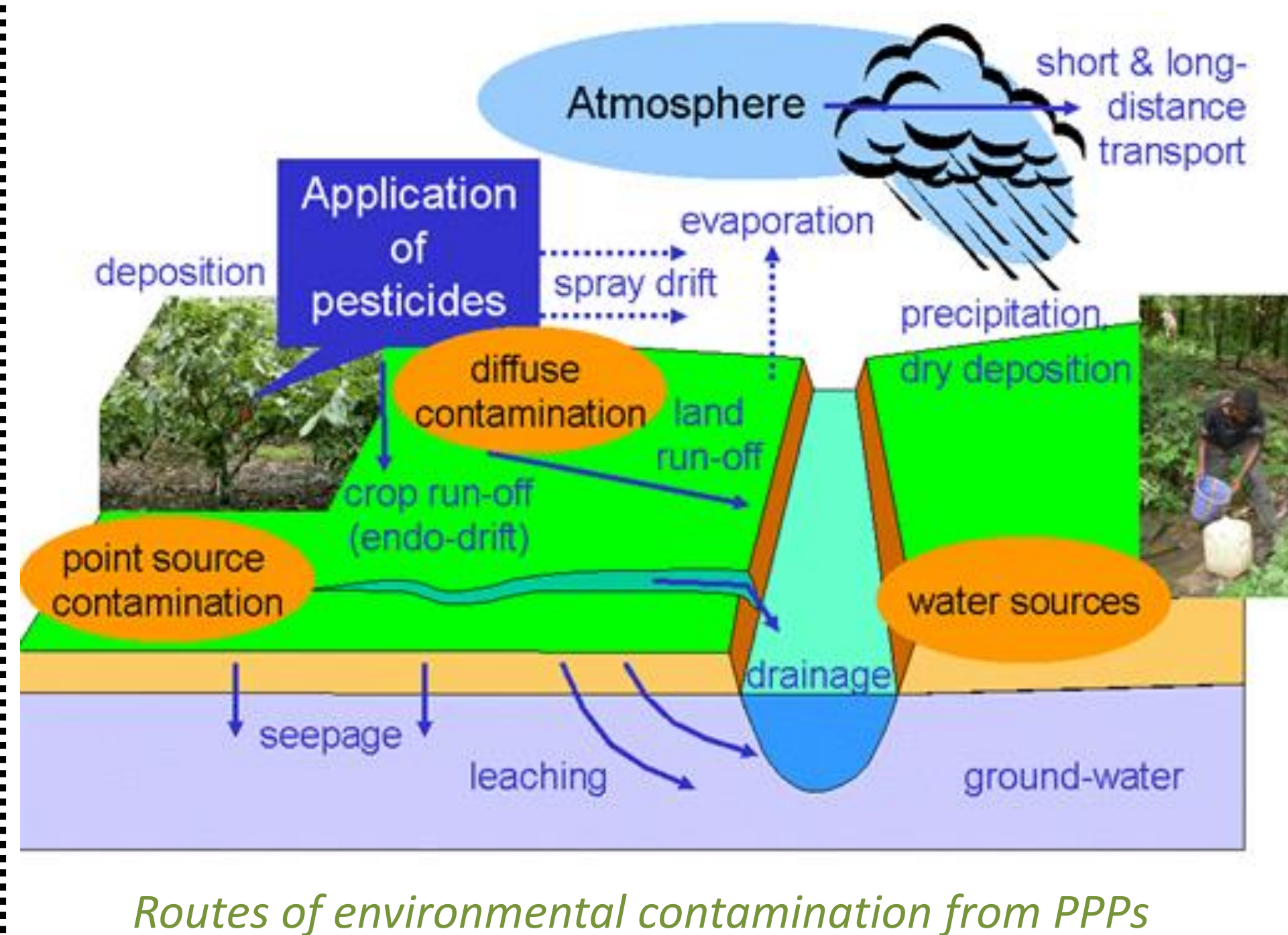


OPTimised Integrated Pest Management for precise detection and control of plant diseases in perennial crops and open-field vegetables

The Problem

Global agriculture relies on synthetic Plant Protection Products (PPP) for plant disease control to support sustainable yield productivity. Farmers and crop advisors follow conventional crop protection strategies that were established after the Green Revolution (1950-1960), maintaining significant use of PPPs despite the negative impacts on the environment and human health. This clearly indicates that more sustainable PPPs should be used under common rules for safer and more efficient application.



OPTIMA Overall Objective

The overall objective of OPTIMA is to develop an environmentally friendly Integrated Pest Management (IPM) framework for use-cases in Apple orchards, vineyards and open-field carrots by providing a holistic approach which includes the major elements related to integrated disease management:

- combined use of bio-PPPs and synthetic PPPs,
- DSS for disease prediction,
- spectral disease detection systems,
- precision spraying techniques.

The Approach

The proposed IPM system consists of innovations in DSS for disease prediction, early disease detection methods, alternative synthetic PPPs and substituting/supportive bio-PPPs, optimized dosage and timing of treatment schemes, and smart spraying applications of PPPs to improve deposition and coverage, while reducing the risk of contamination.



DSS accuracy level

DETECT for identifying and localizing the disease infection severity, developing an advanced portable disease detection system mounted on a tractor based on spectral images analyzed using pattern recognition and deep learning techniques to achieve high-speed and accurate infection detection.



Grape downy mildew (A), Alternaria leaf blight (B) and apple scab (C, D)

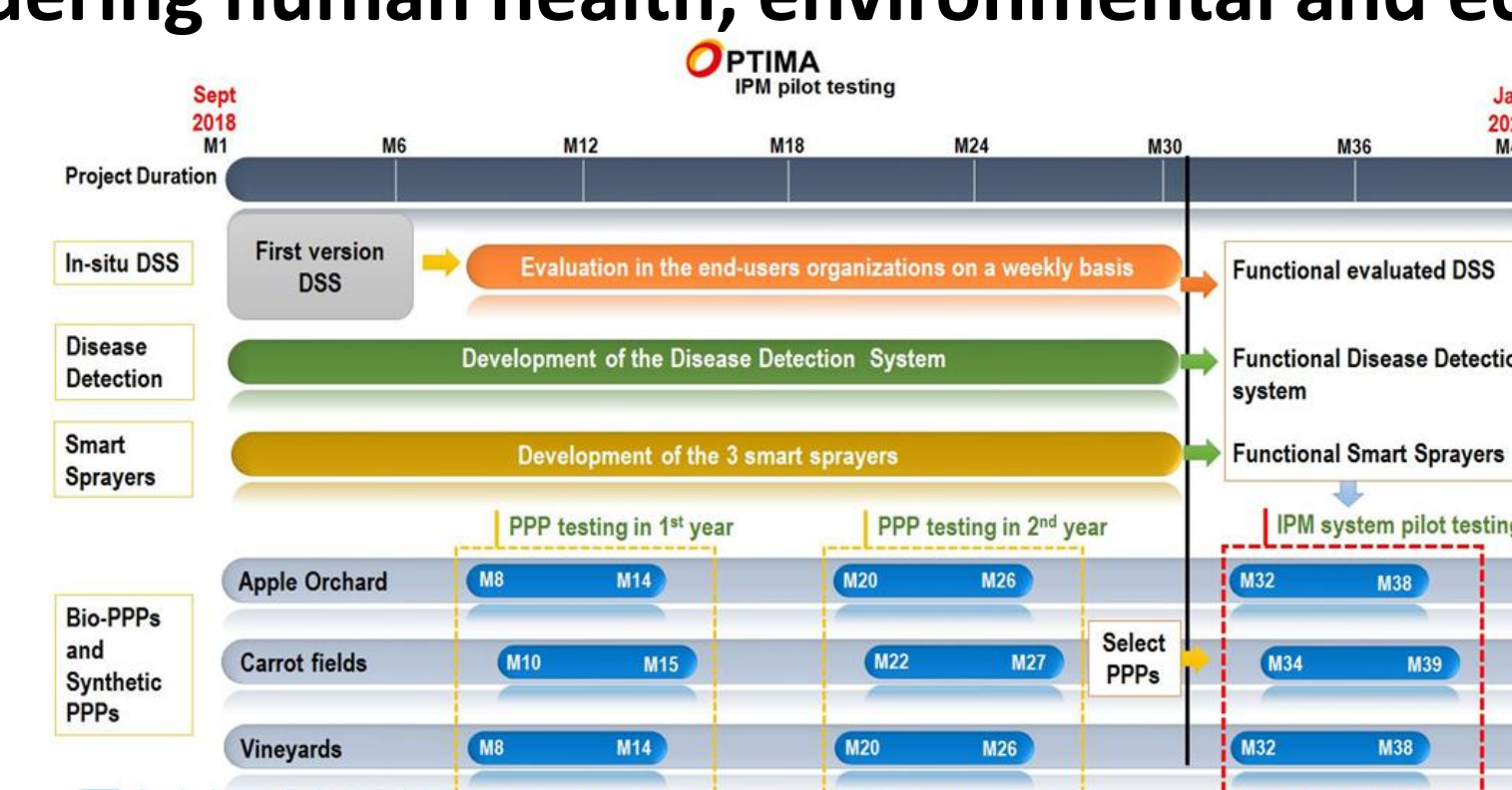
SELECT for determining the appropriate PPP formulation (synthetic and biological) with increased specificity and improved environmental performance (e.g. with reduced effects on non-target organisms and natural resources), the dosage and the timing of the application for each disease, after continuous field experiments with PPPs, as well as PPP resistance testing.

APPLY for developing three new smart sprayers for precise PPP field use by optimizing the spray configuration, characterizing droplet size, adjusting nozzle types and air-support systems, implementing developed software and hardware solutions for drift control, variable rate application, section and droplet size control.



Smart sprayer concept ideas

ASSESS for evaluating the IPM system regarding its direct and indirect impacts and risks from a life-cycle perspective considering human health, environmental and economic impacts and risks.



OPTIMA Main work-flow diagram

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