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**SALUTE DELLE PIANTE**

2020

# Plant Health: the Challenges of Research and the Contribution of the Universities in Lombardy

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# Outline

1. Plant health: the research perspective
2. Scientific approach to plant health: the contribution of three major Universities in Lombardy (UNIMI, UNIPV and UNIBS)
3. New paradigms for plant health management



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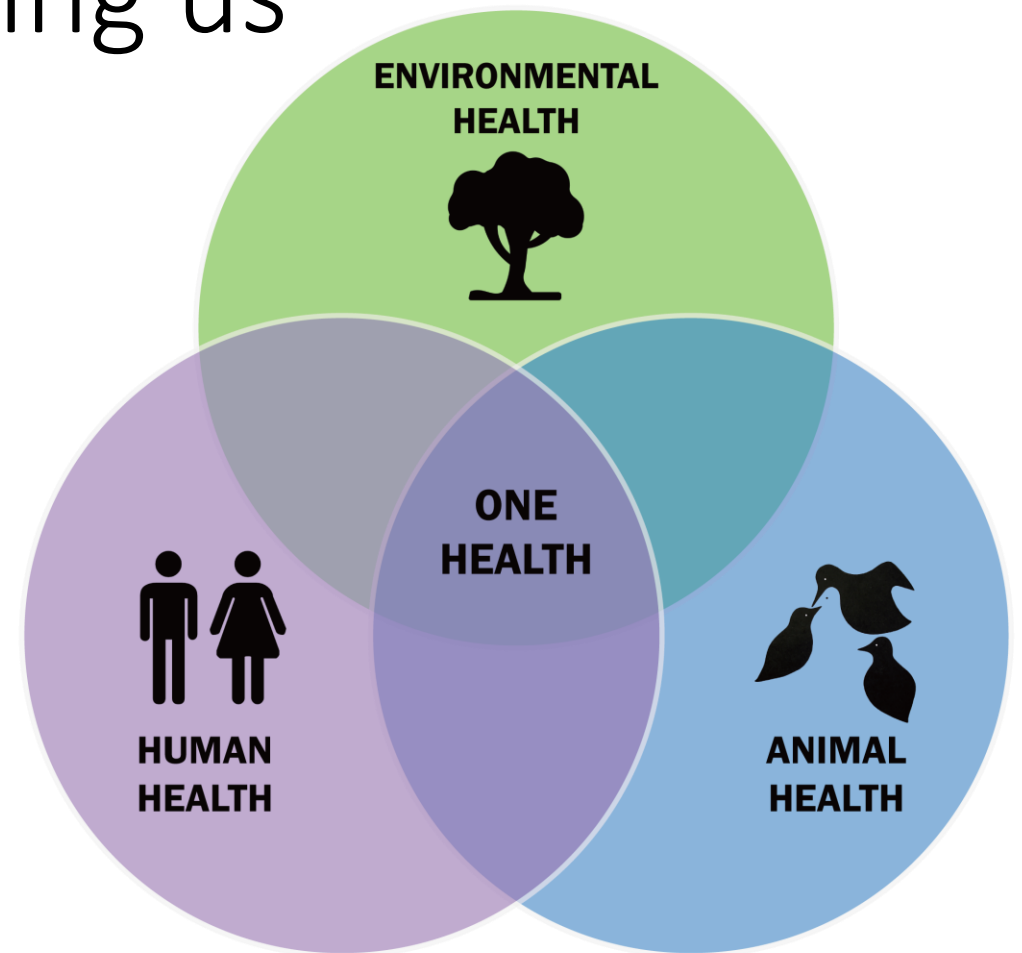


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# What plant health is teaching us

- Plants and their health are at the basis of ecosystem services
- Ecosystem services are at the basis human health and wellbeing
- Health in an holistic perspective (one-health)
- Sustainability in an interactive perspectives (overcome any anthropocentrism)



# What is plant health?

## What is not plant health?

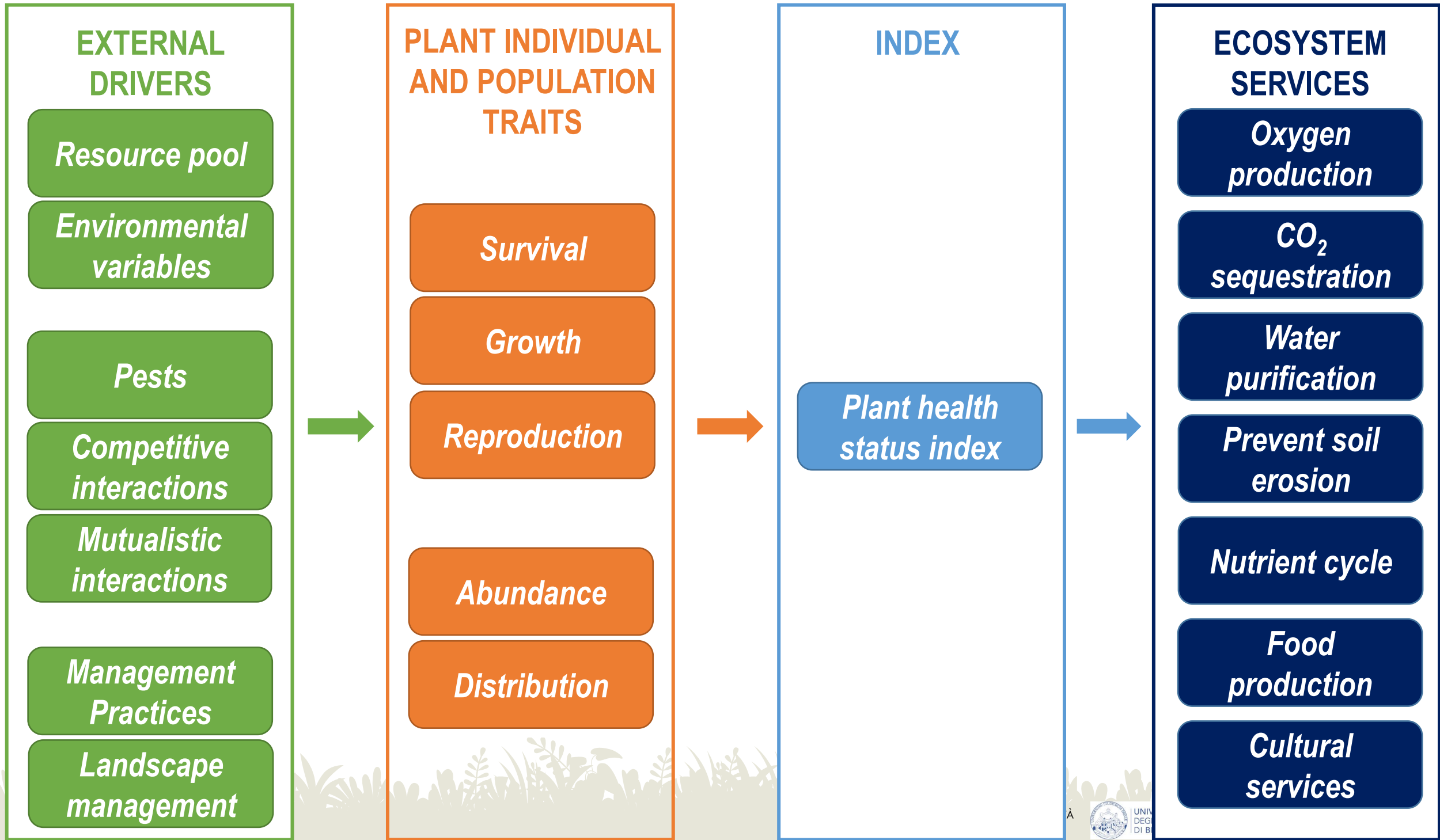
- It not just the absence of suffering or diseases

## Some elements related to plant health

- An emerging properties
- Outcome of a system of interacting and dynamical components
- Is closely related to ecosystem services



# 1. Plant health: the research perspective



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# How to analyse the complexity of plant health

- Multi-scale approach
- Systemic approach
  - Based on the investigation of the interactions among species
- Multi-dimensional approach





# The contribution of three major Universities in Lombardy



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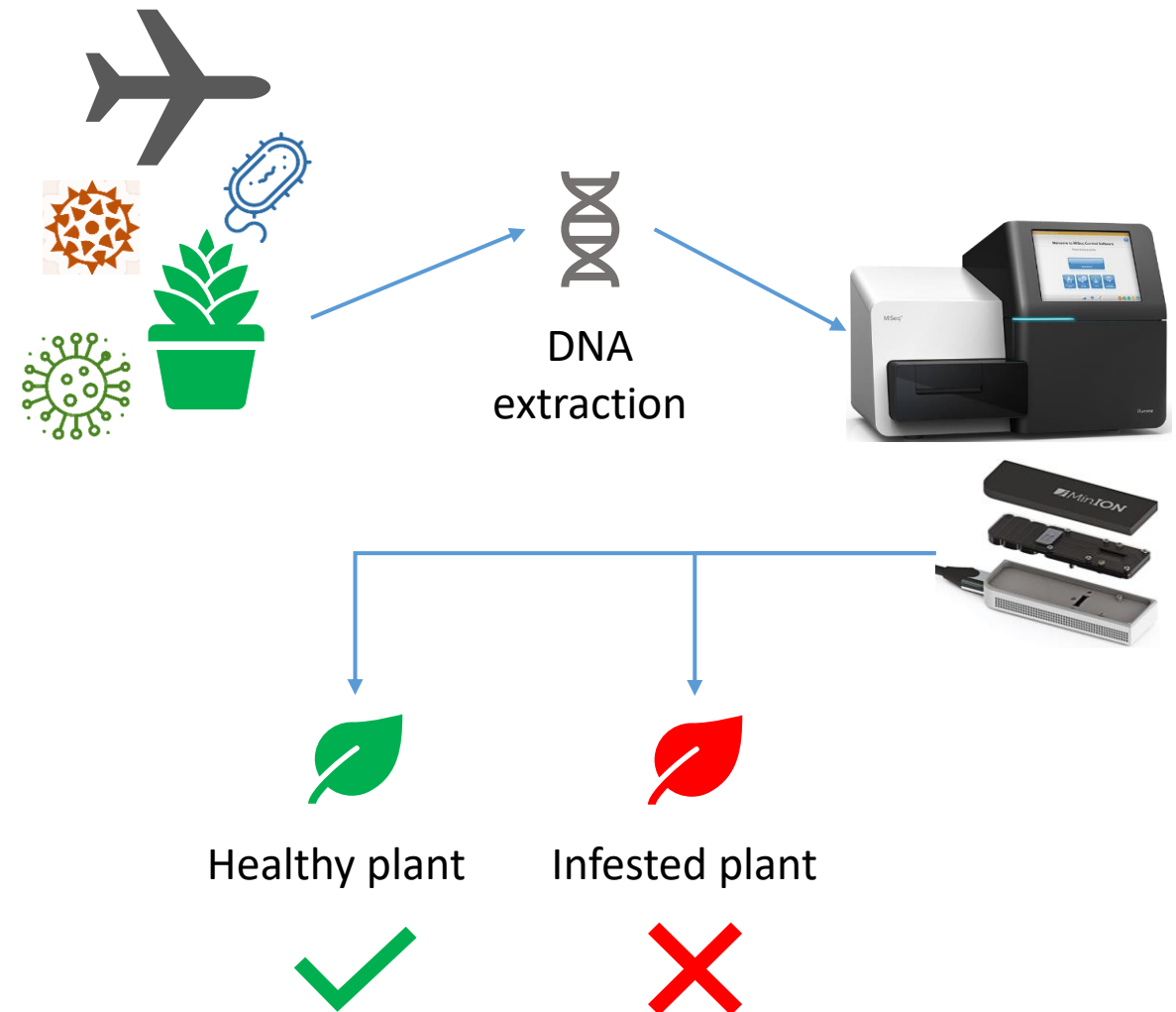


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# Multi-scale approach

## Molecular scale

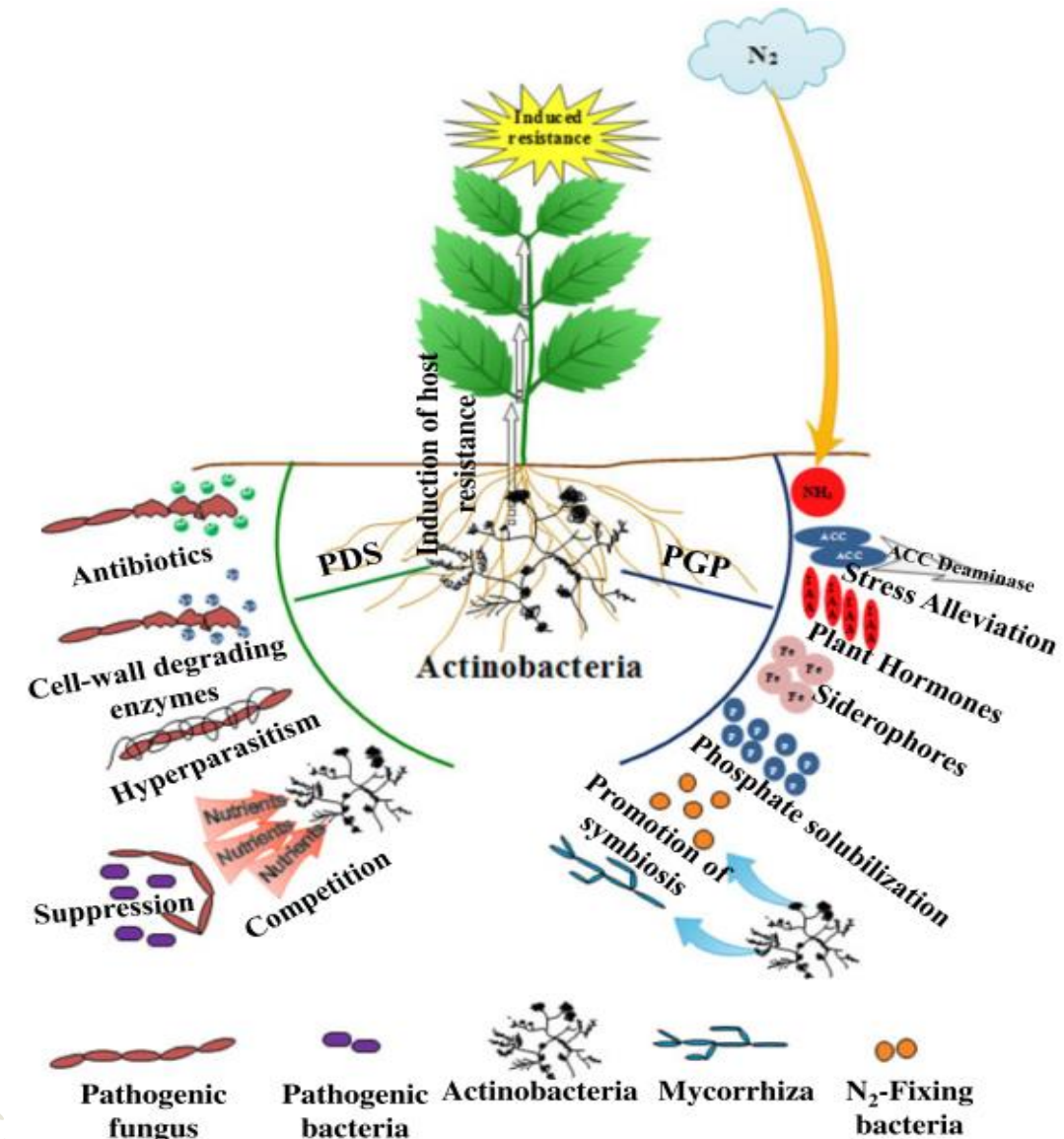
- Molecular taxonomy applied to biosecurity and monitoring:
  - DNA sequence analysis for identify and monitor invertebrate diversity
  - Identification of pathogens through Next Generation Sequencing



# Multi-scale approach

## Individual scale

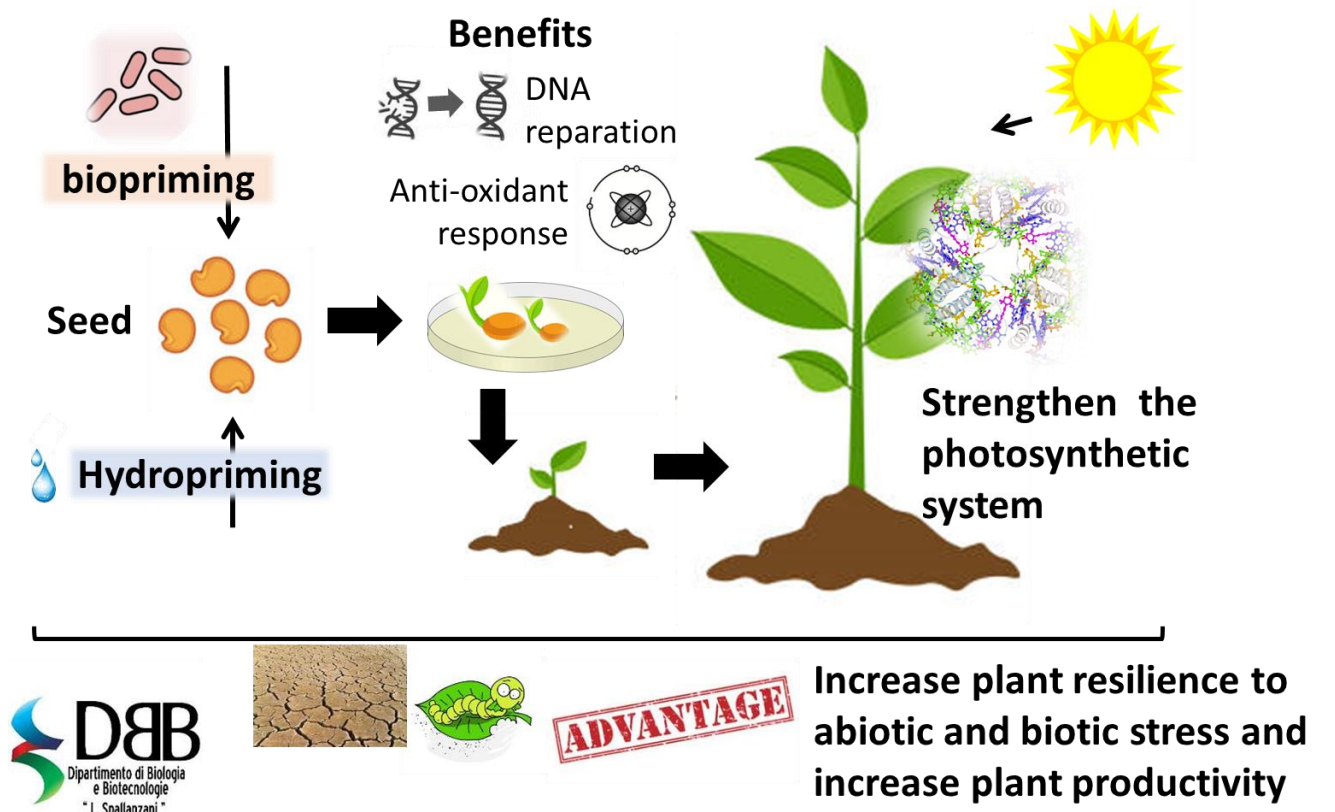
- Study the biology of invasive species
- Study plant's immune system
- Study plant growth and productivity



# Multi-scale approach

## Individual scale

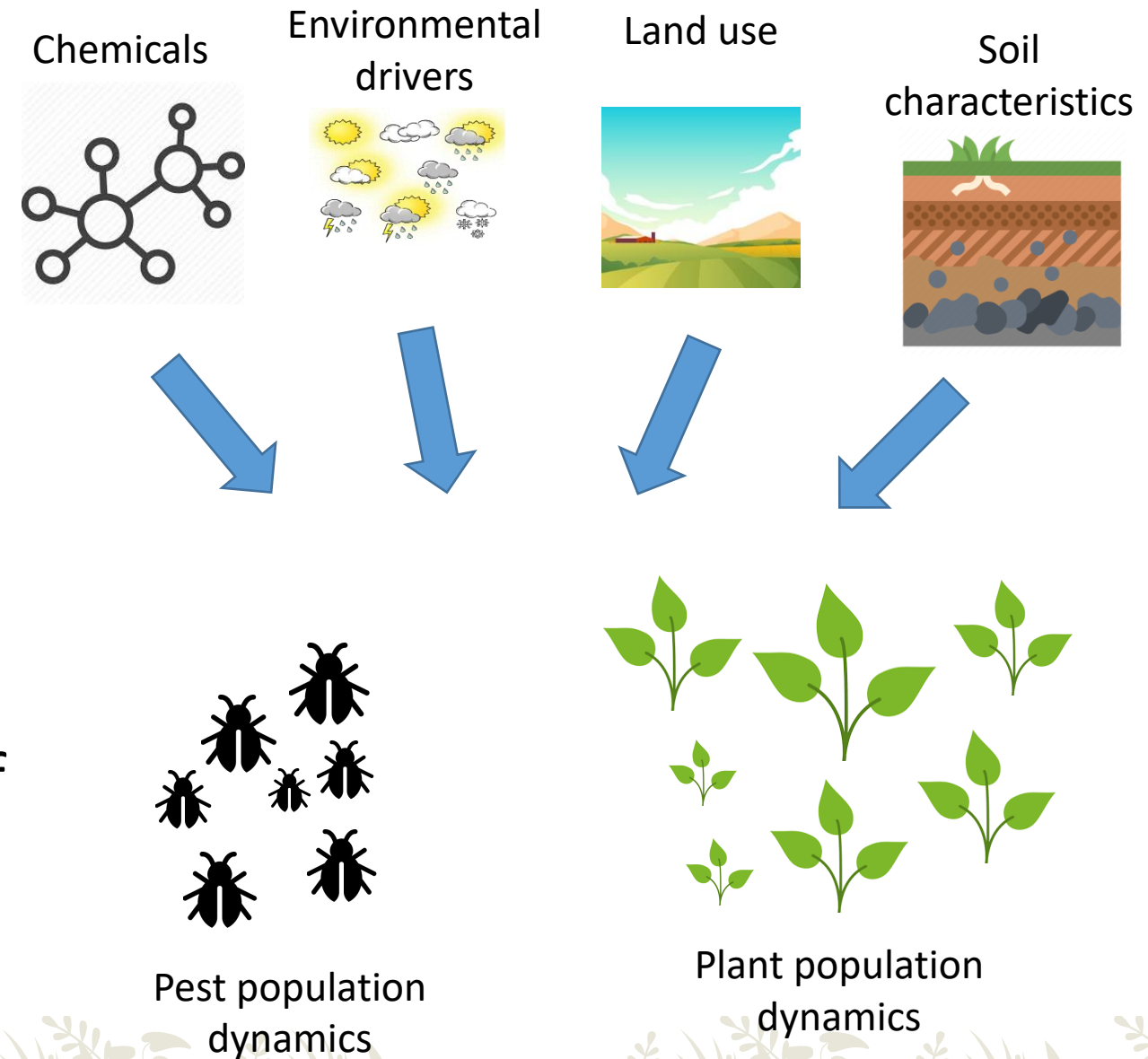
- Enhance seed health through priming techniques



# Multi-scale approach

## Population scale

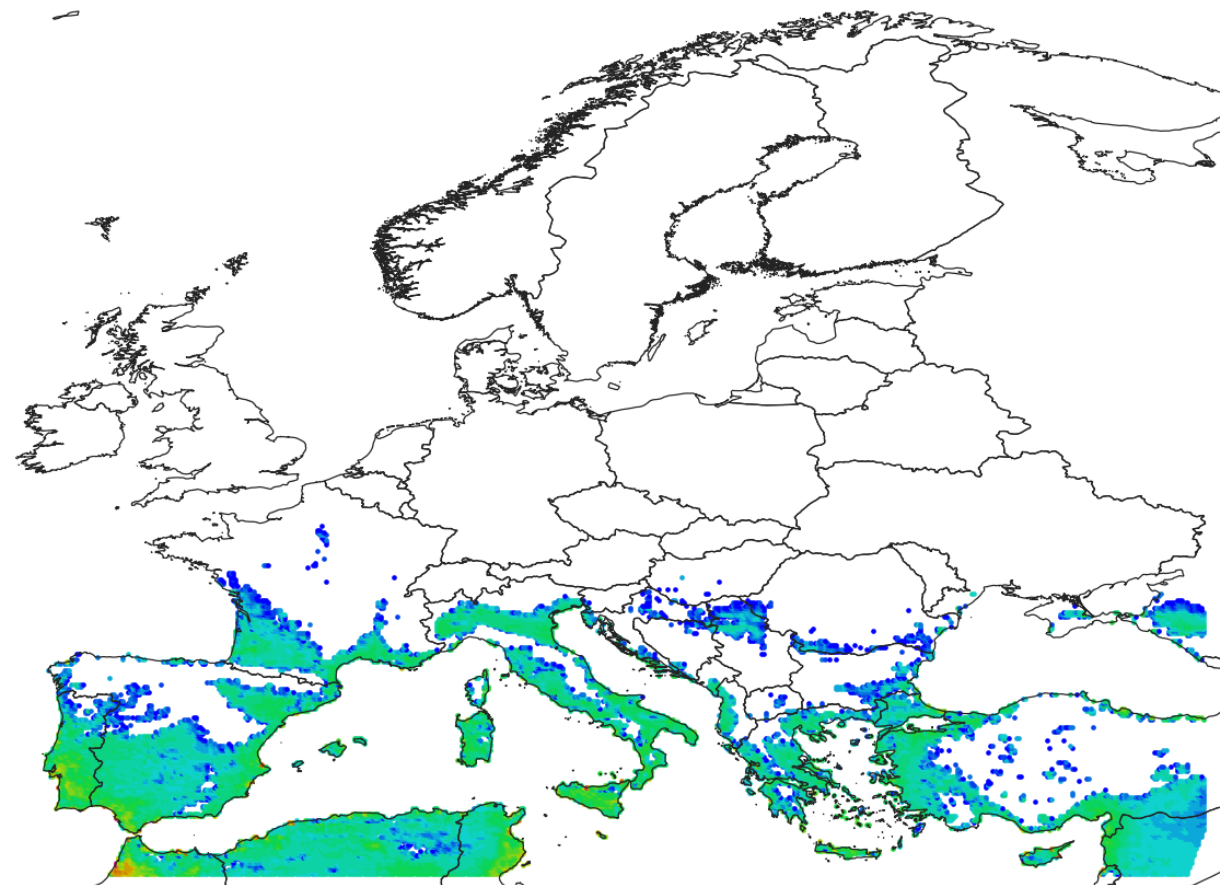
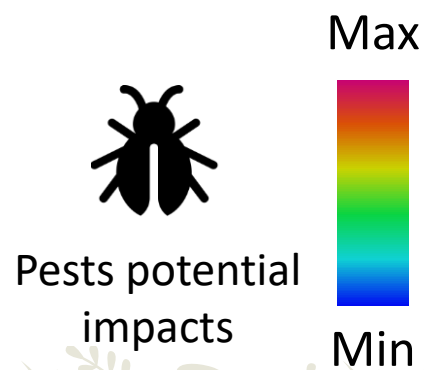
- Monitoring invasive species
- Investigating the risks of entry, establishment, spread and impact of plant pests
- Investigate the effects of external drivers on the population dynamics of pests and plants



# Multi-scale approach

## Continental scale

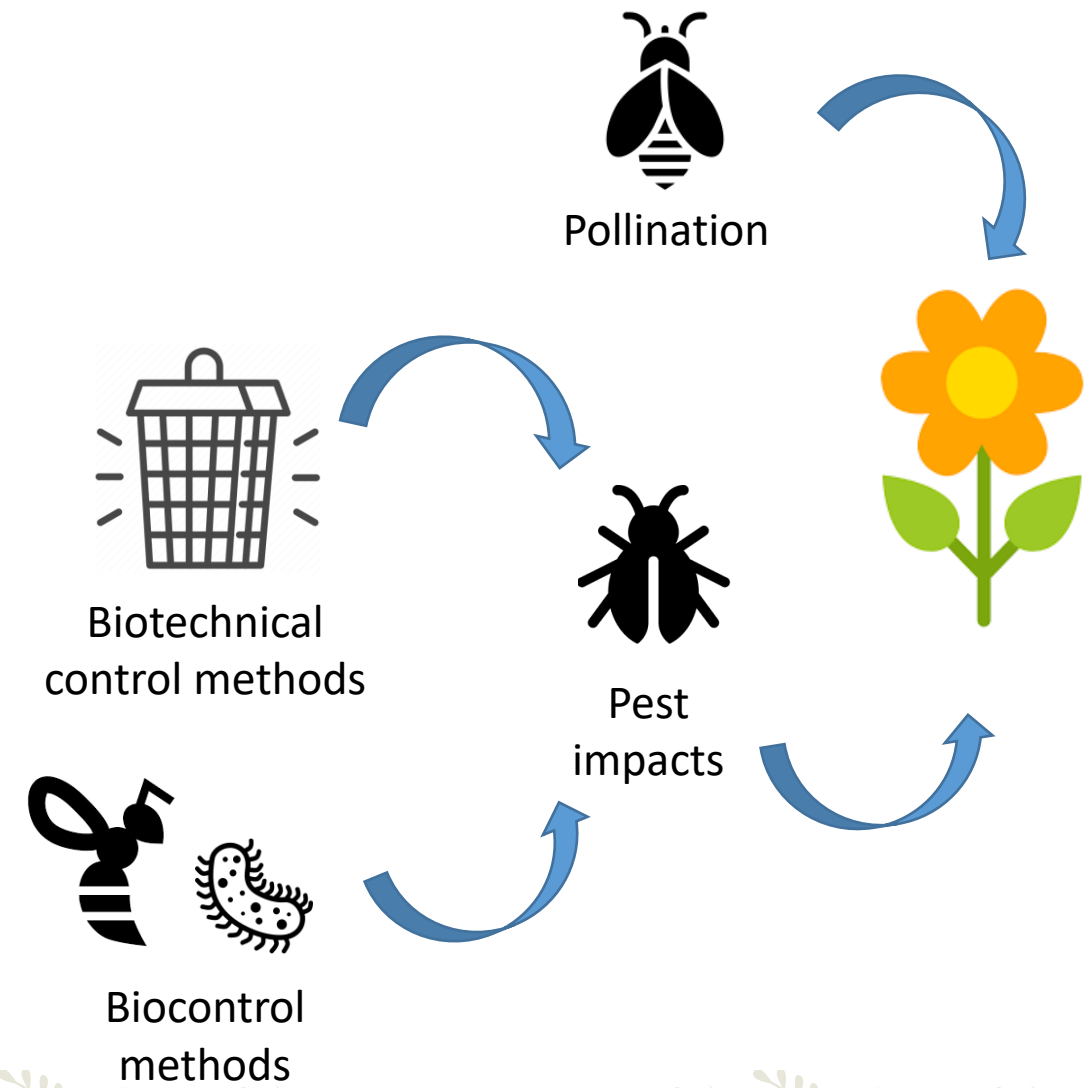
- Quantitative evaluation of pest impacts
- Prioritisation of the risks linked to plant health



# Systemic approach

## Species interaction and biocontrol techniques

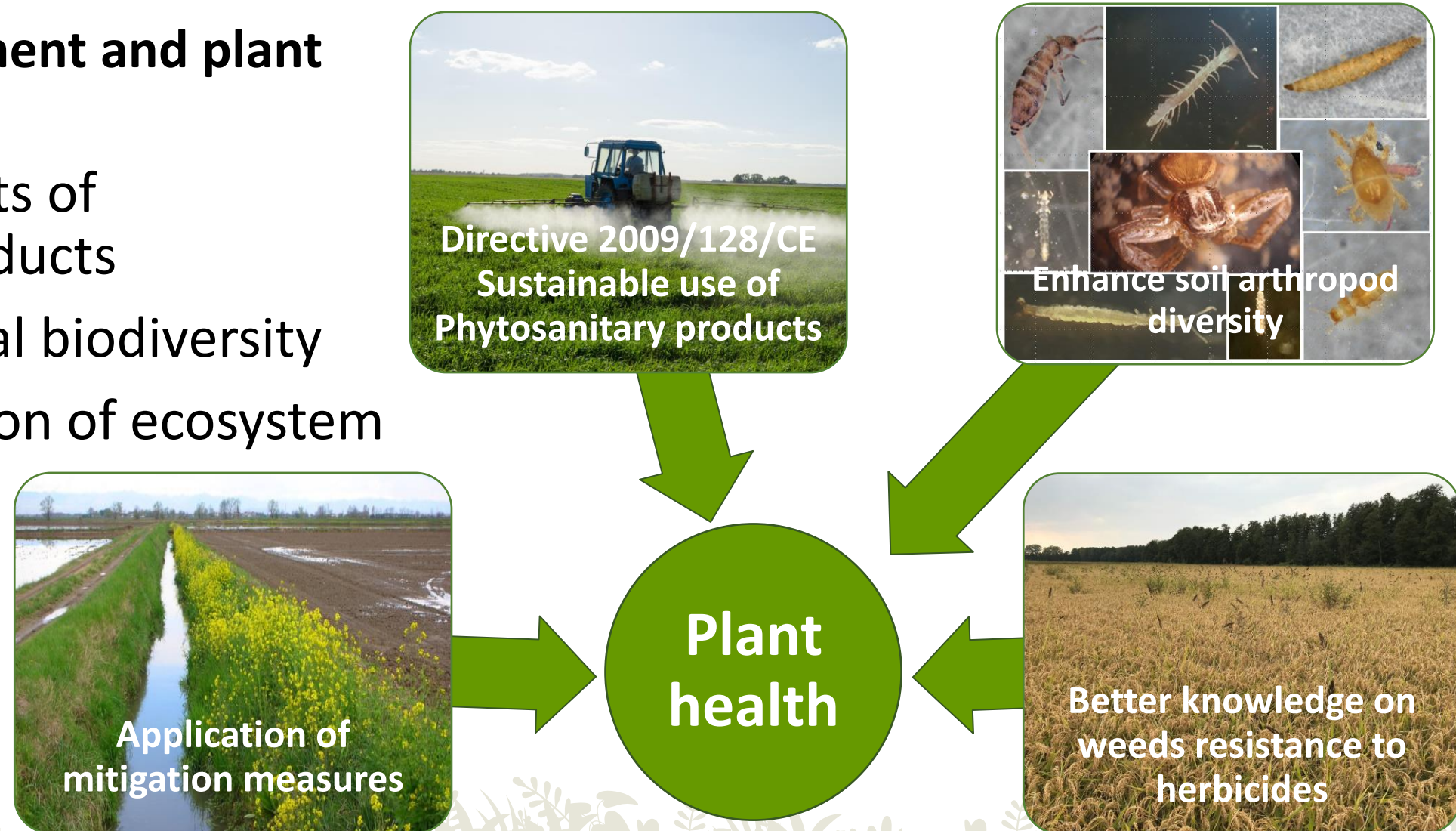
- Investigate the relations (predation, parasitism, symbiosis etc.) between arthropods and plants
- Investigate the use of biological control agents (e.g. predators, parasites, parasitoids etc.) or biotechnical methods for the control of pests



# Systemic approach

## Landscape management and plant health

- Reduce the impacts of phytosanitary products
- Preserve functional biodiversity
- Ensure the provision of ecosystem services







# Multi-dimensional approach

## Economic dimension

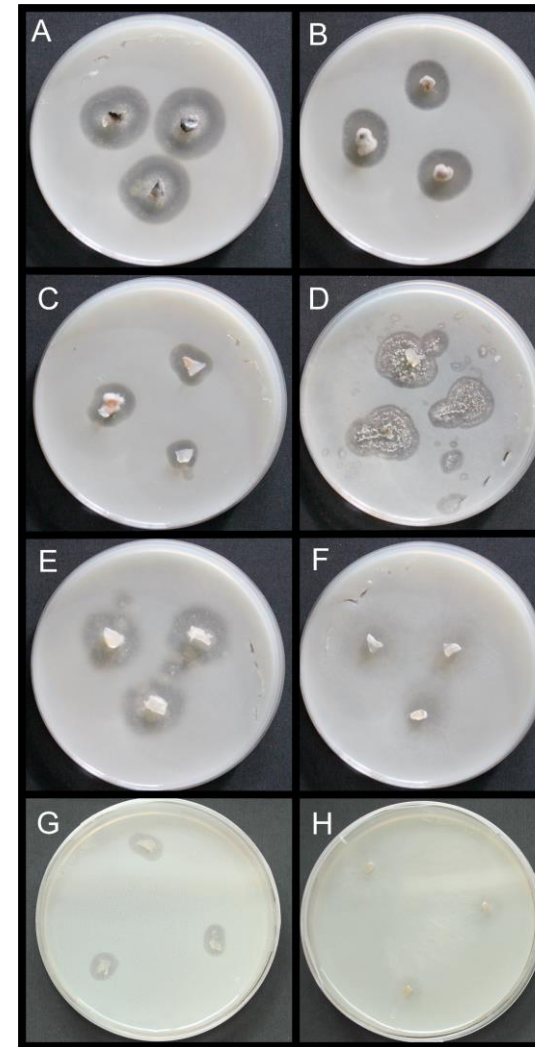
- Synthesis of new bioactive molecules from agri-food wastes
- Production of biofertilisers based on the fermentation of *Trichoderma* spp



# Multi-dimensional approach

## Environmental dimension

- Identification and use of fungi useful for bioremediation: degradation of environmental pollutants



# Multi-scale approach

## Environmental dimension

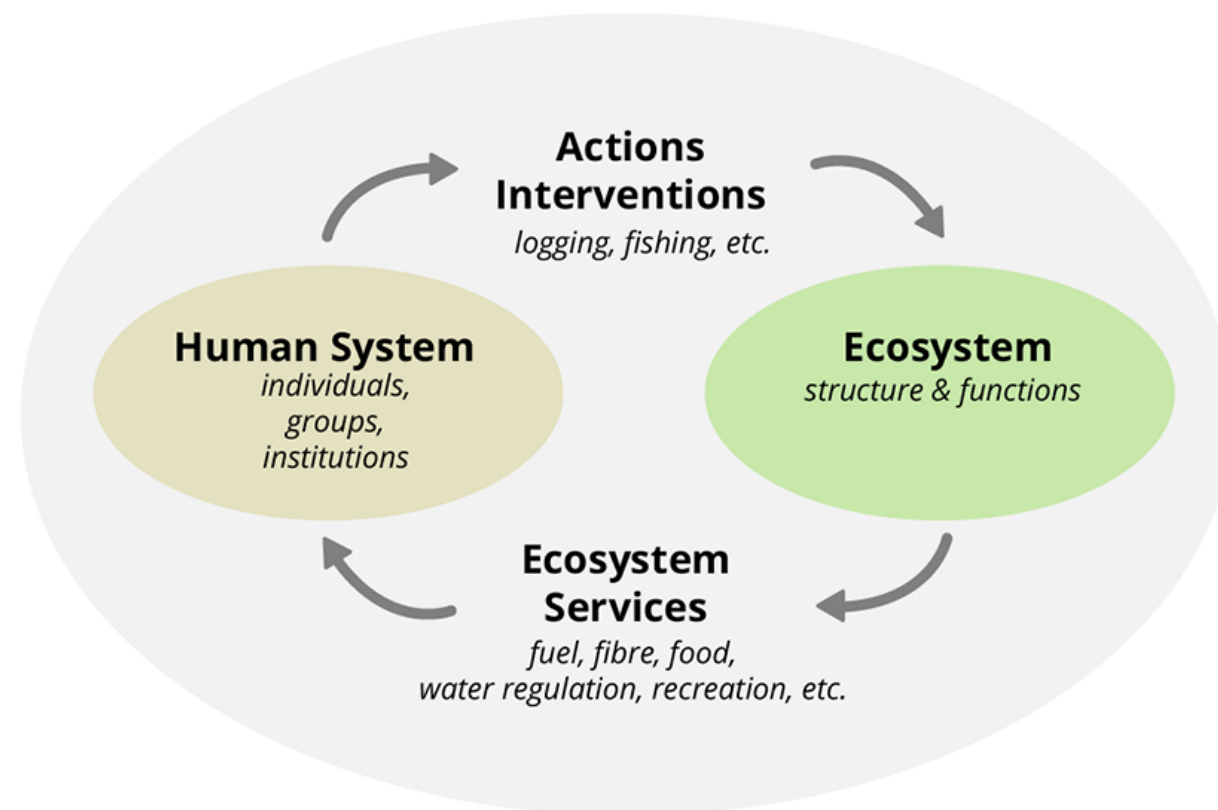
- Promoting natural capital conservation: extraction and conservation of genetic materials for the generation of new plant varieties



# Multi-dimensional approach

## Social and governance dimension

- Integration between pest management, resilient communities, functional biodiversity and land use



# Multi-dimensional approach

## Social and governance aspects

- Spread and impact of agricultural pests and invasive species influencing food security and socio-economics
- Impact of agricultural pathogens threatening human health



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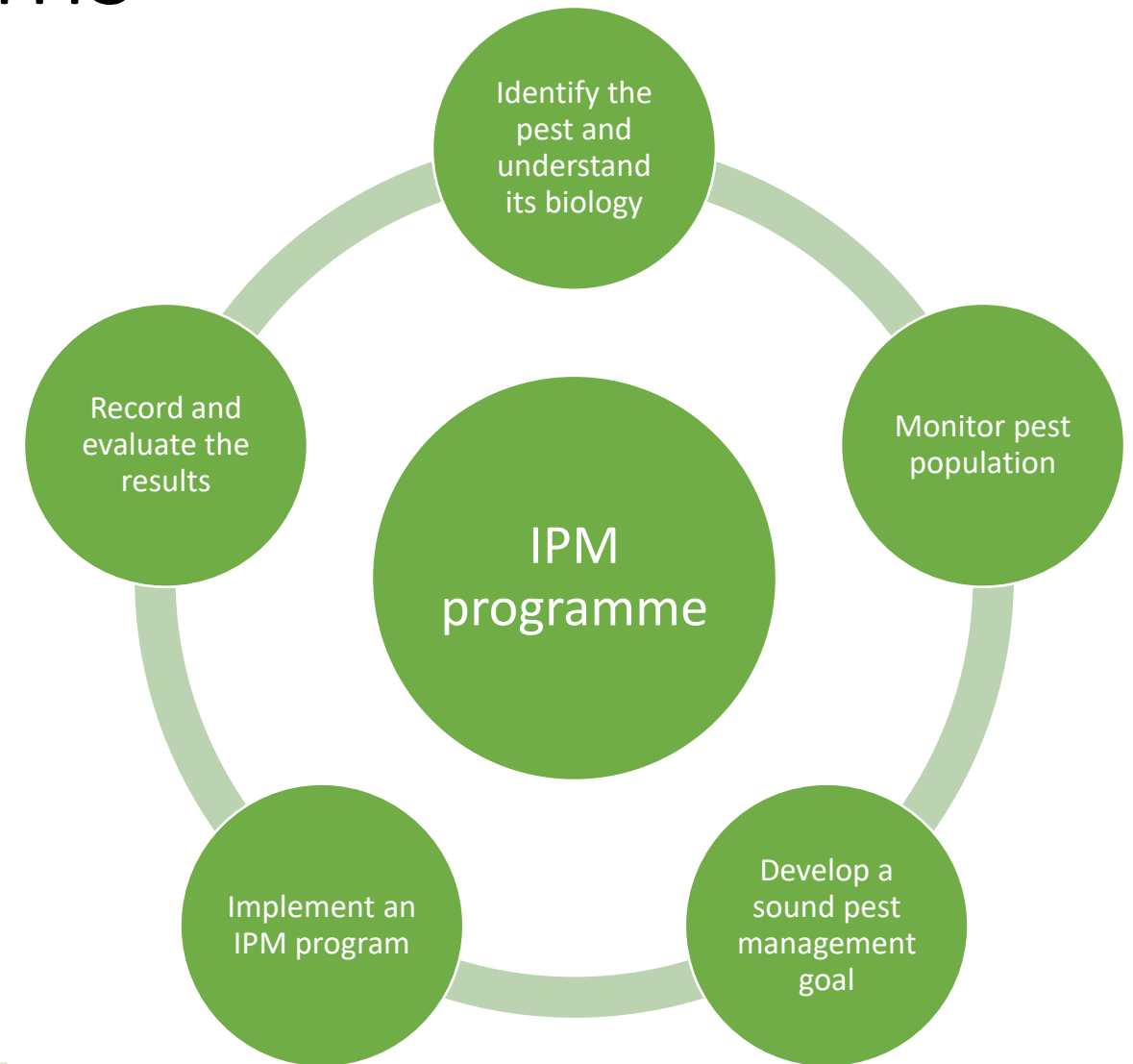


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# The evolution of paradigms

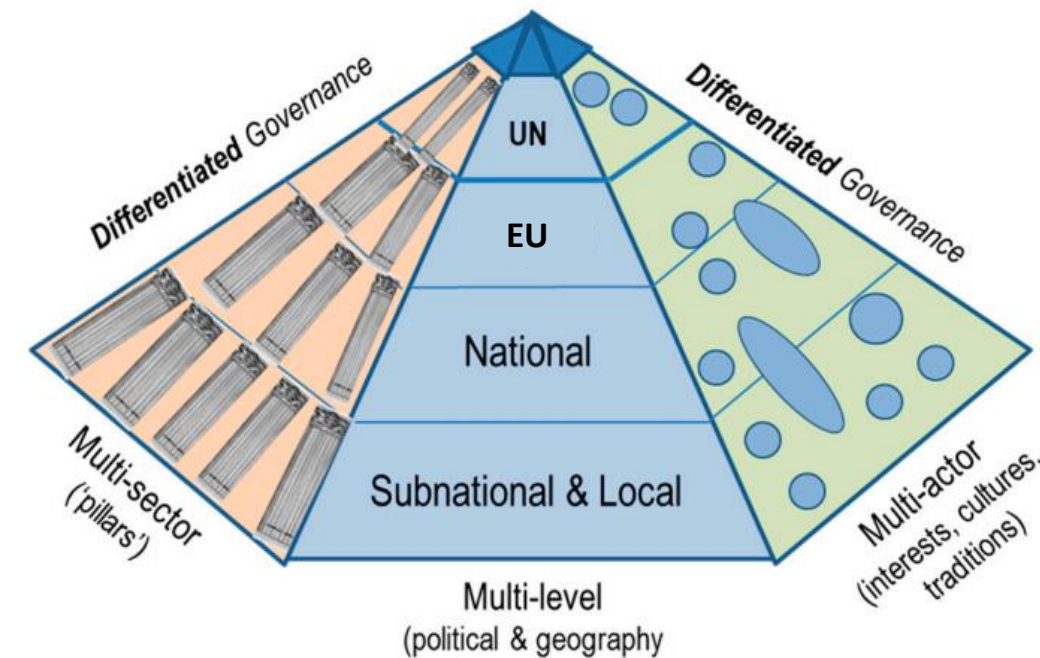
- Linear paradigm: the management of plant health based on a single technology (it is still used)
- Integrated paradigm: based on the Integrated Pest Management (IPM) approach



# The challenge of complexity

## From problem management to system management:

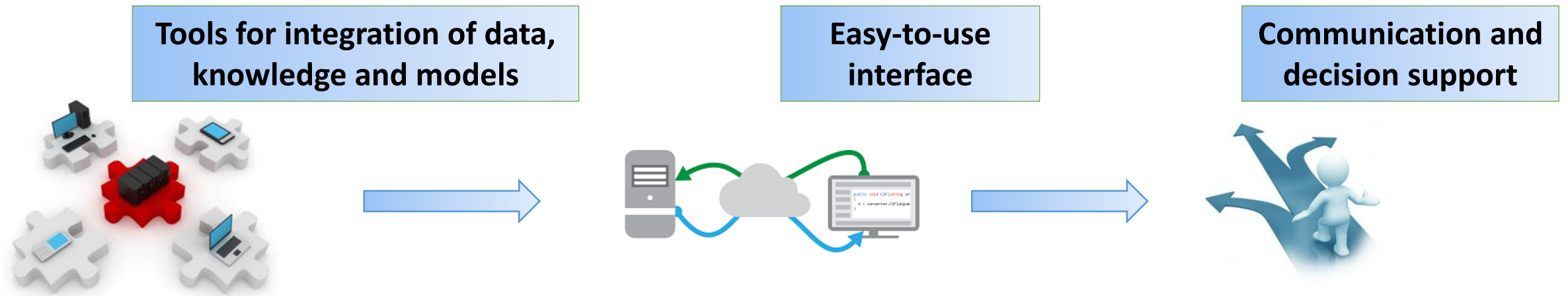
- Multi-level: from field to area-wide management
- Multi-actor: consider all the components of the system
- Multi-sector: consider the different stakeholders involved





# Fill the gap between research and application

Tools that allow the access to information and knowledge, and support decision-making (tactics, strategies, policies)



# Enhance collaborative solutions

- Approaches to management
  - Adaptive strategies
  - Government principles and meta-government strategies
- Collaborative solutions
  - Complementing hierarchical and market solutions
  - Support communication among stakeholders
  - Sharing perspectives
  - Mutual support and collaboration with trust
  - Involvement of multiple stakeholders' community



# Thanks to...

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Thank you for the attention!

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