BEYOND

Building epidemiological surveillance and prophylaxis with observations both near and distant

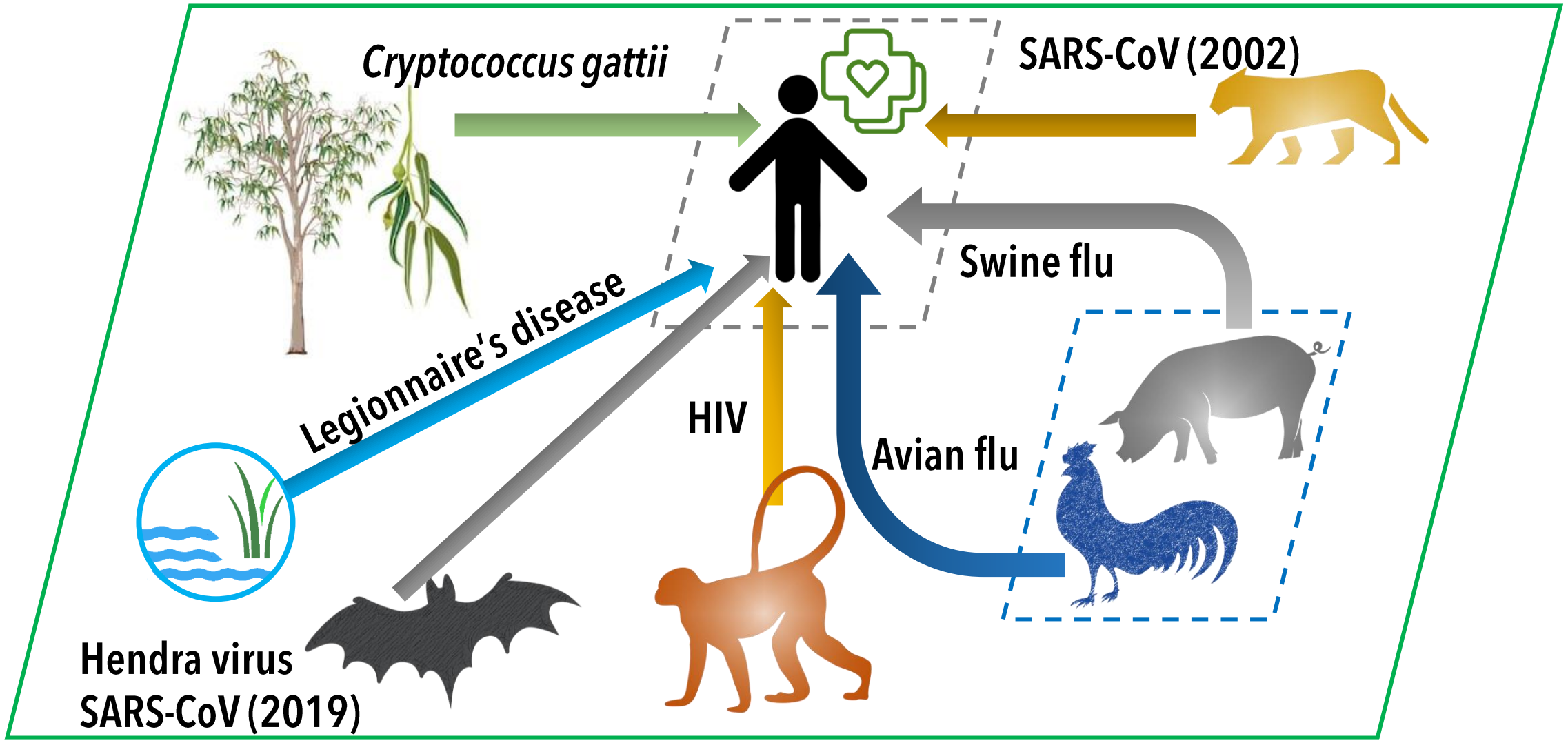
Cindy E. Morris – *INRAE-PACA, UR0407 Pathologie Végétale*
with Samuel Soubeyrand – co-coordinateur, *INRAE-PACA, UR0546 BioSP*

Kick-off meeting, 23 Septembre 2020

CONTEXT

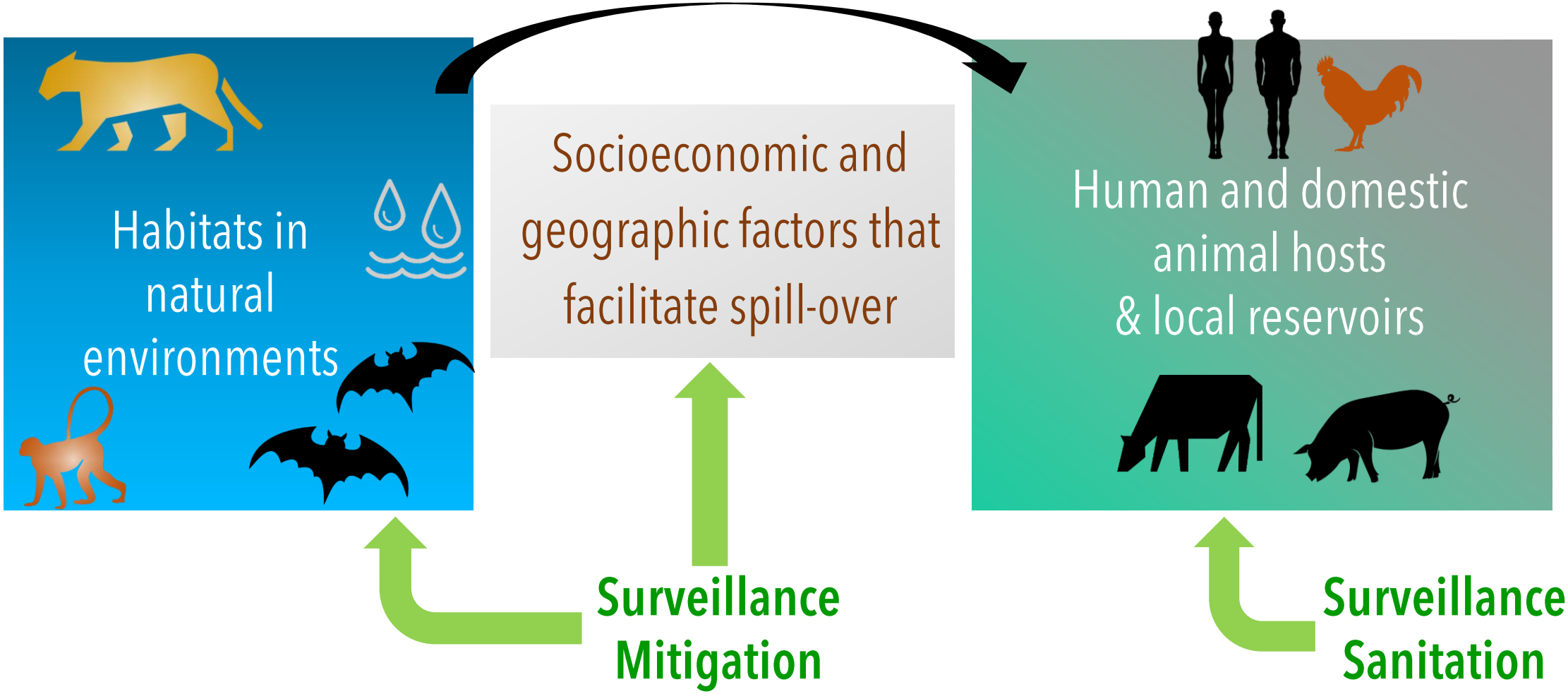
CONTEXT

Emergence of novel human diseases



CONTEXT

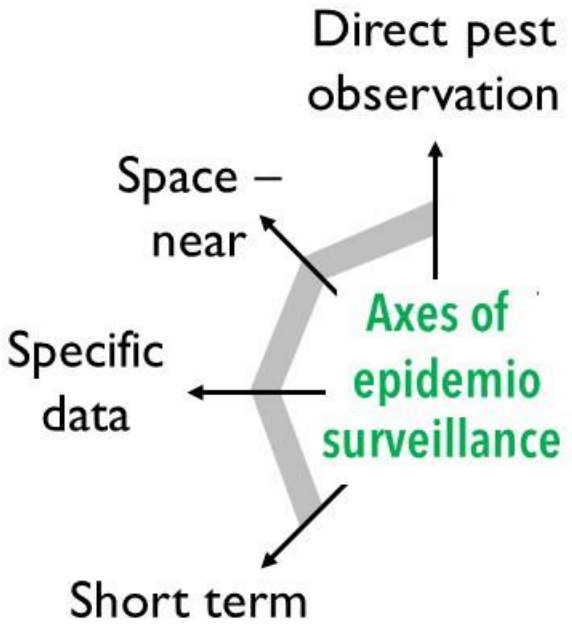
One Health: a complex multifactor framework for epidemiology

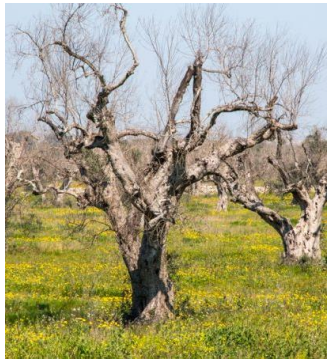


OBJECTIVES

Build a complex multifactor framework for plant disease epidemiology

Today

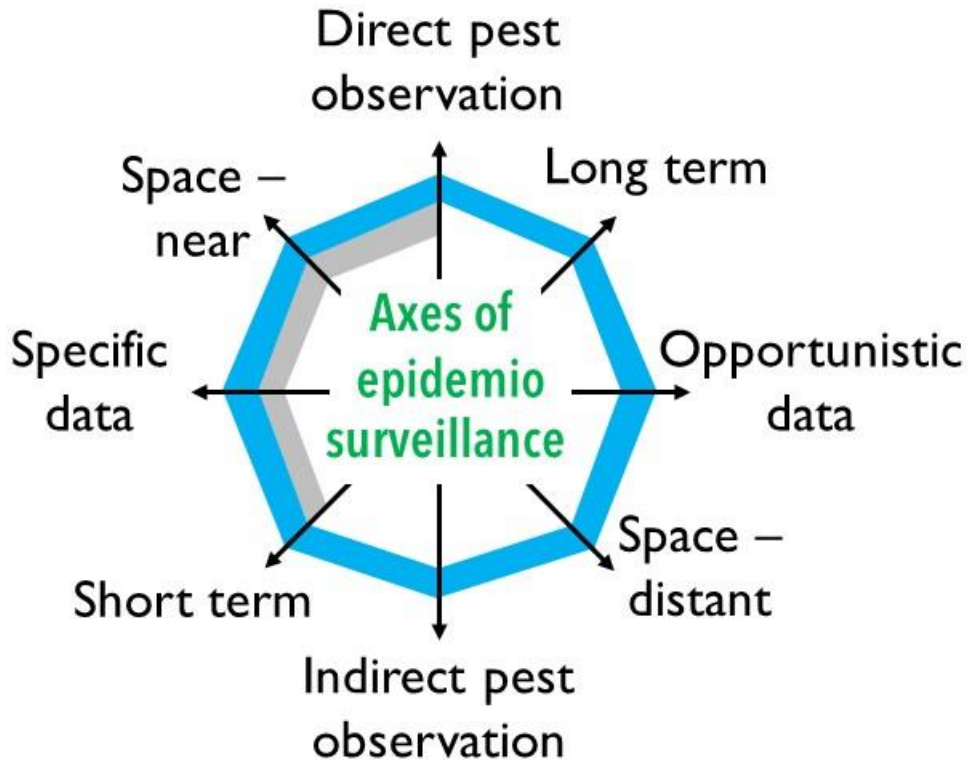


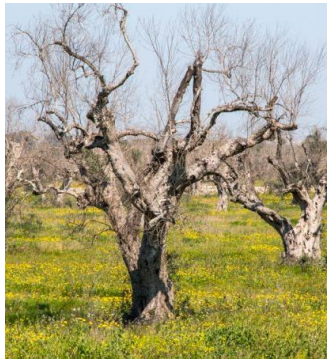


OBJECTIVES

Build a complex multifactor framework for plant disease epidemiology

Tomorrow





OBJECTIVES

Historical meteorological trends and future predictions

Pest bio-sensor data

Regional land use & landscape data

Adjacent crops

Data from abiotic sensor networks

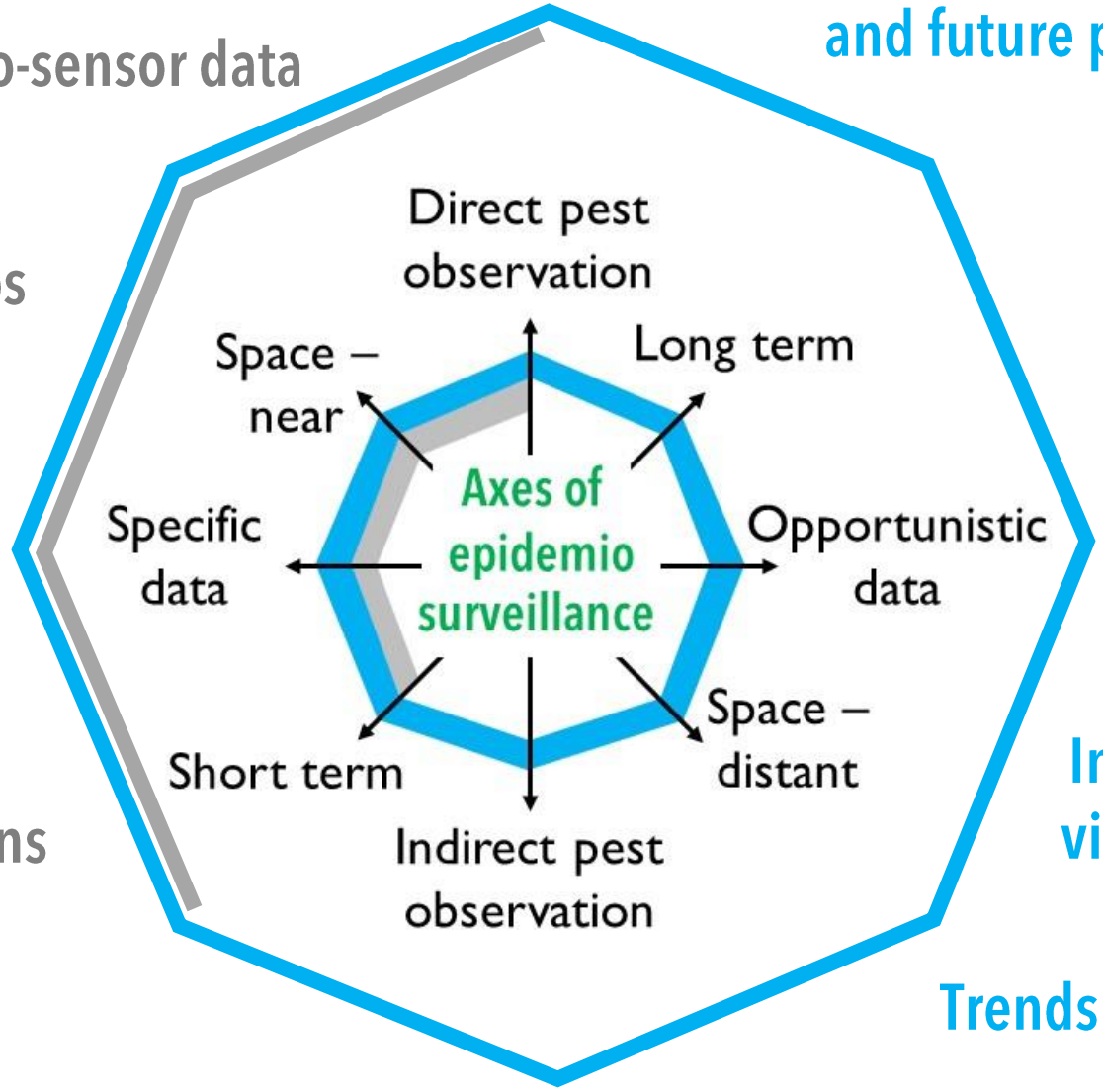
Abiotic conditions

Interconnectedness of regions via water, wind, transportation

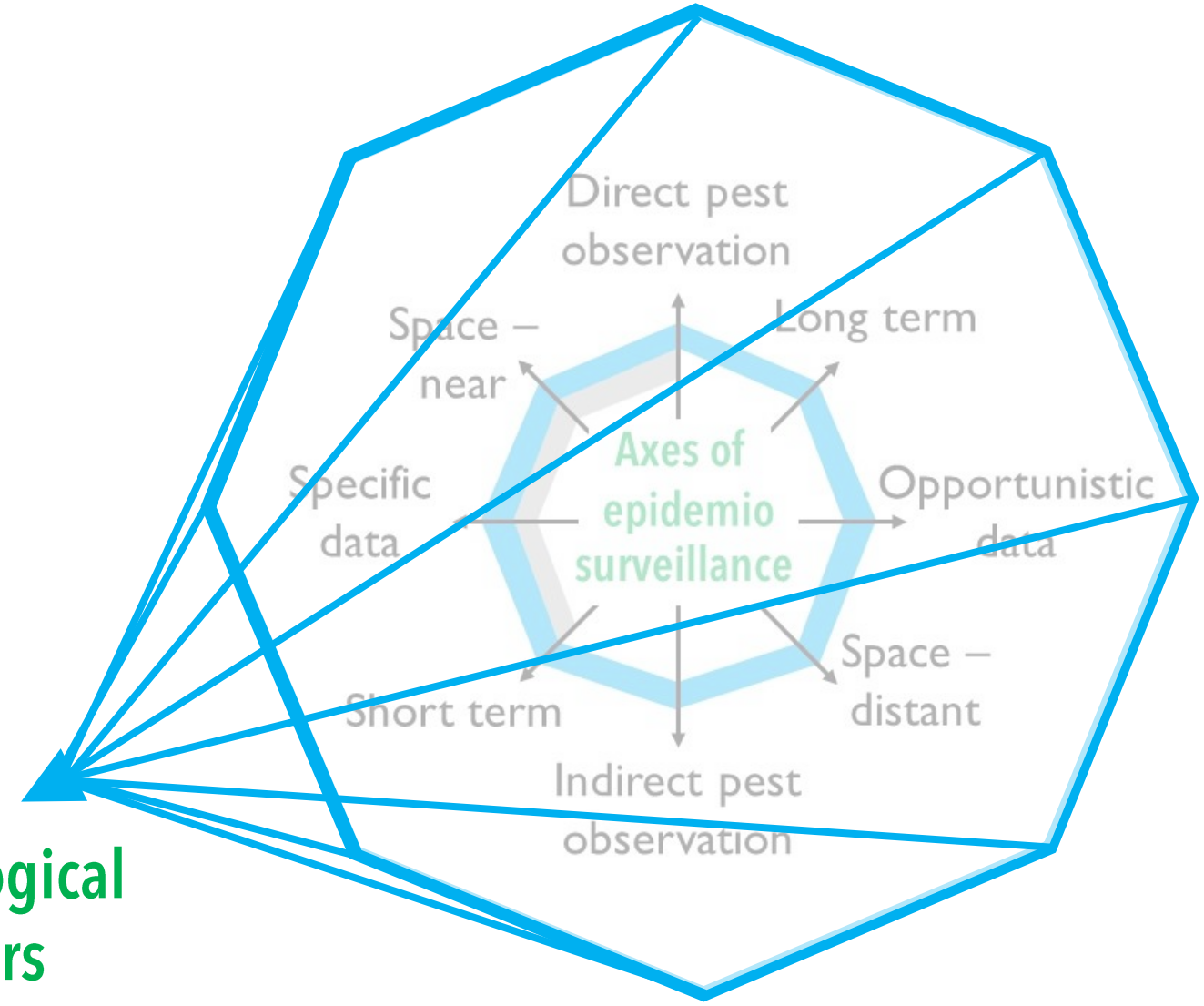
Plant health bulletins

Trends from text mining

Remote-sensing data



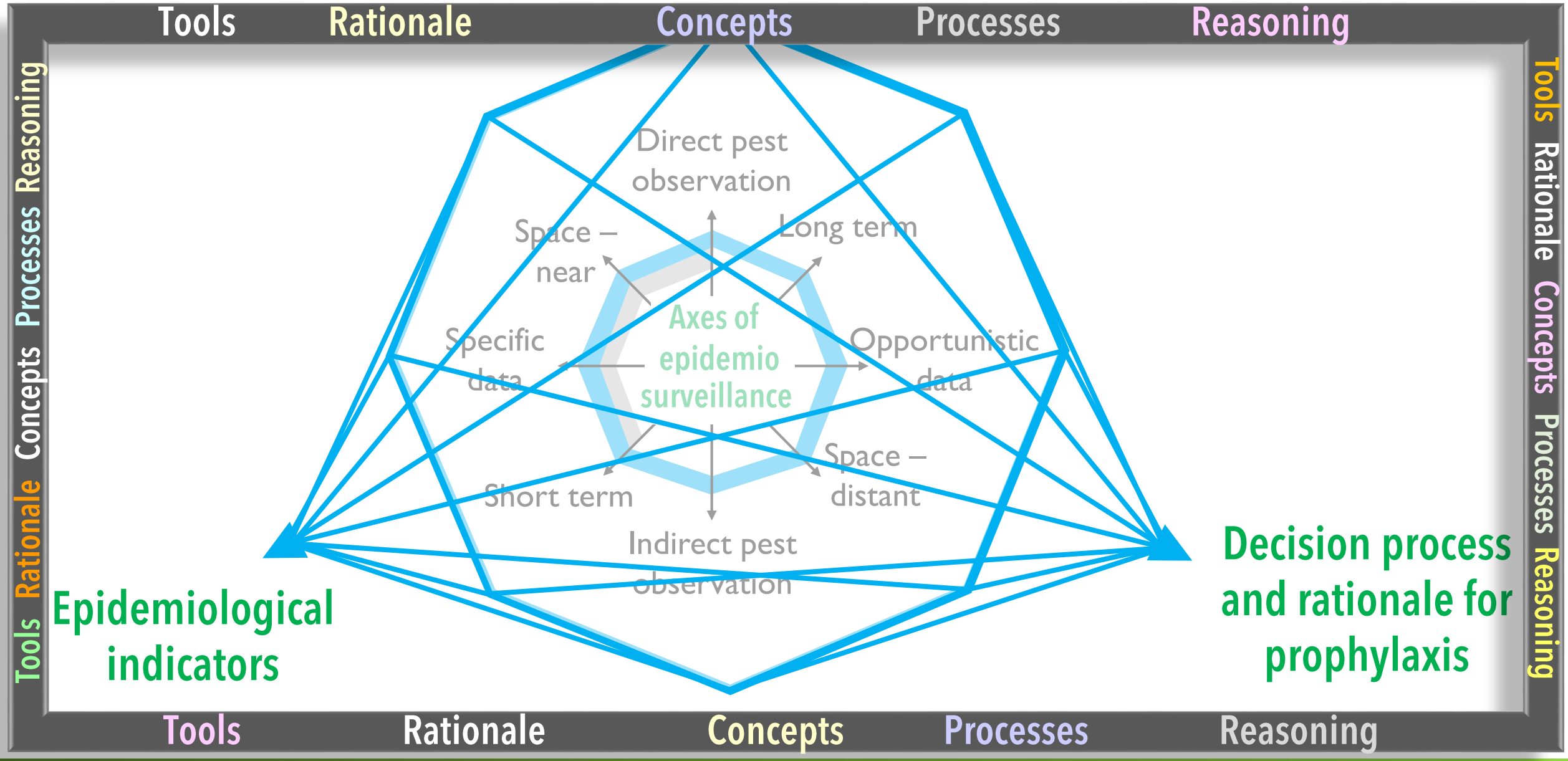
OBJECTIVES



Epidemiological indicators

OBJECTIVES

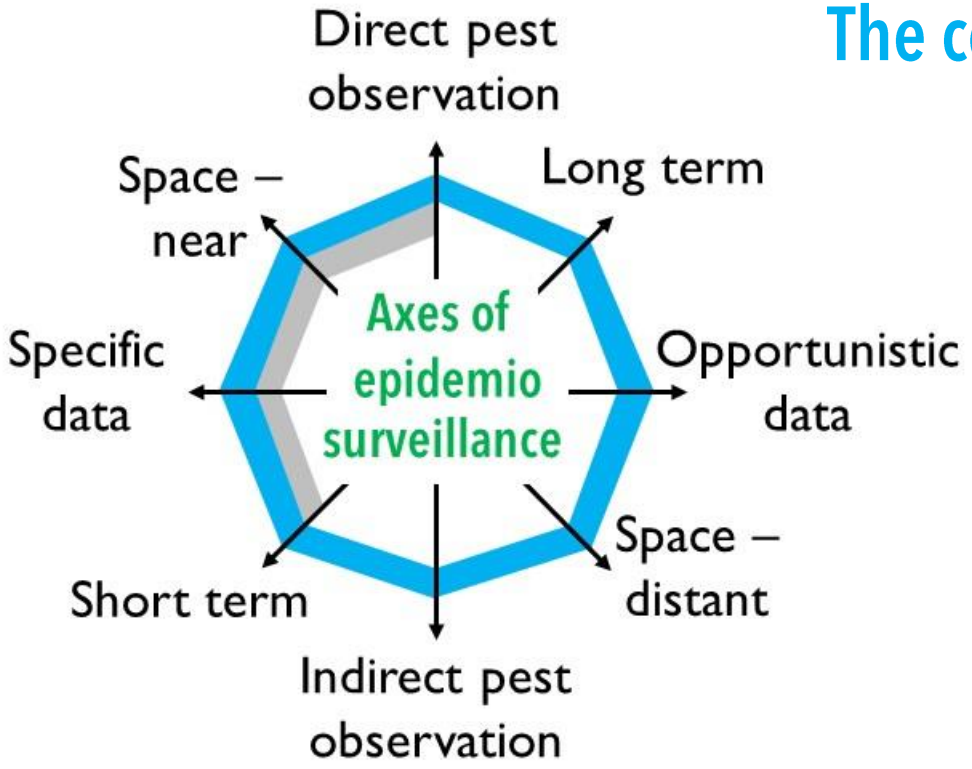
FRAMEWORK



EXPECTED ACHIEVEMENTS

Today → **Tomorrow**

The context for BEYOND



New epidemiological indicators

New decision processes and rationale for prophylaxis

EXPECTED ACHIEVEMENTS

Create more opportunities

and increase the critical time period

for implementation of prophylaxis

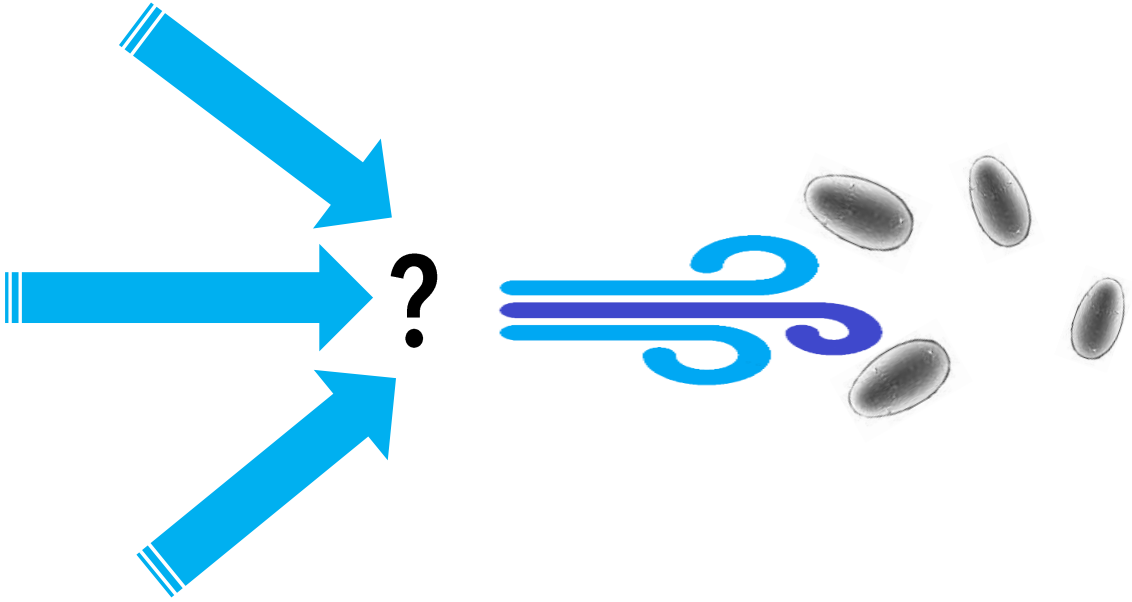
Create approaches that can be applied to multiple patho-systems

Train scientists, surveillance services, field technicians & farmers in the underlying rational

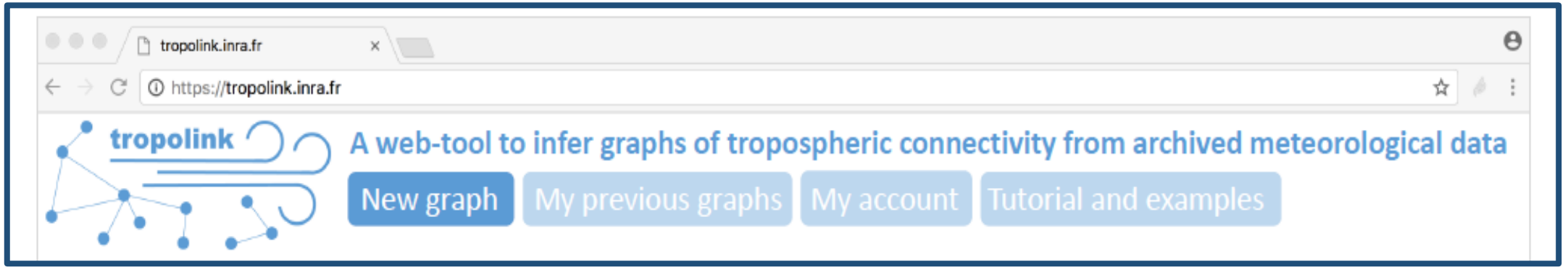
EXPECTED ACHIEVEMENTS

examples

Survey for disease and pest risk upwind, long before they arrive

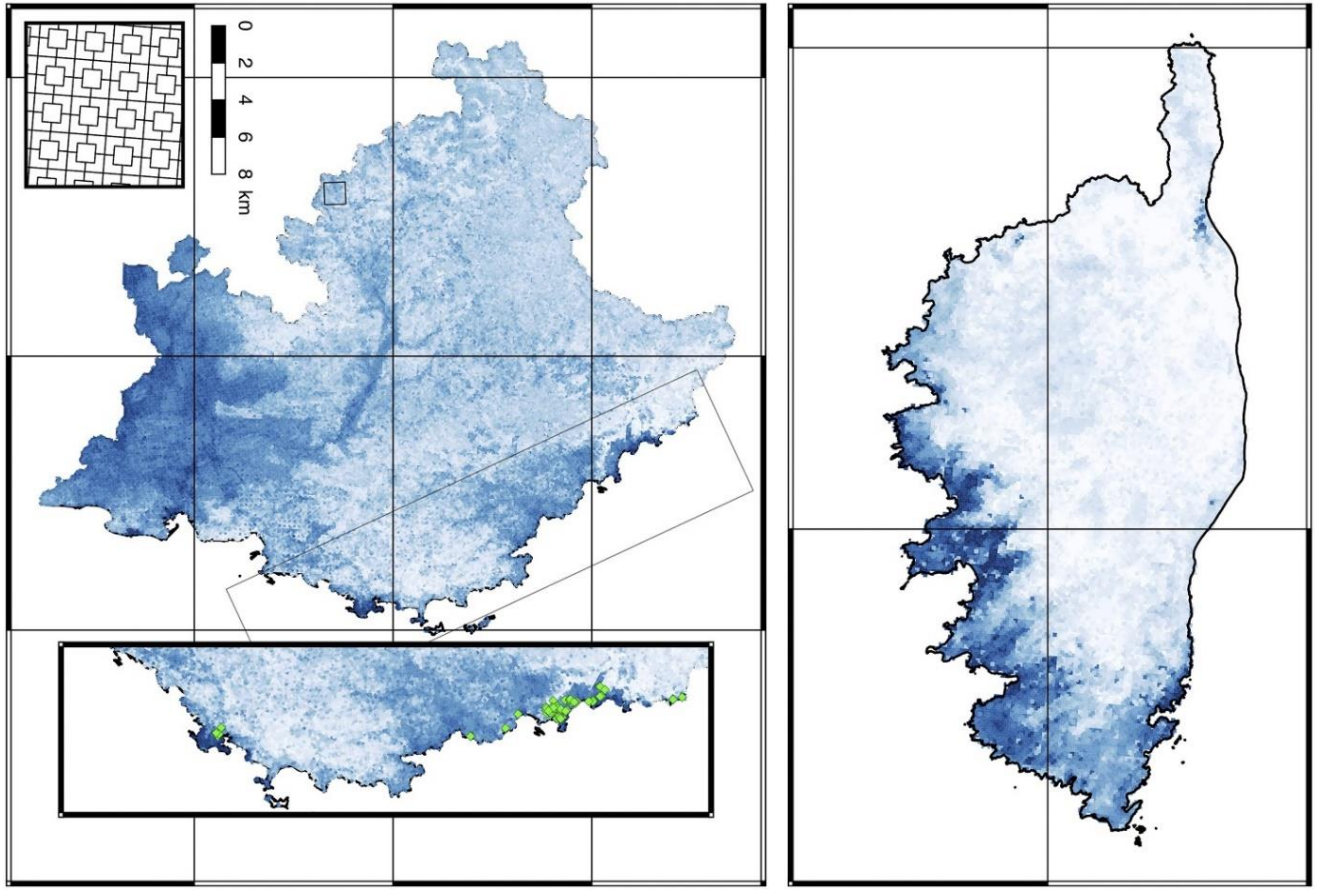


Example:
Powdery mildew



EXPECTED ACHIEVEMENTS *examples*

Identify opportunities to mitigate disease before it occurs



Risk of occurrence in continental FR based on incidence in Corsica

HOW 10 partners, multiple disciplines

Social Sciences & Humanities

- Econometrics
- Consumer / Stakeholder Choice & Behavior
- Communication & Learning

Life Sciences

- Plant Biology
- Agronomy
- Microbiology
- Entomology
- Molecular Biology
- Ecology

Physical & Engineering Sciences

- Applied Math
- Statistics
- Numerical Analysis
- Scientific Computing
- Computer Science
- Information & Intelligent Systems
- Data Base Management
- Graphics and Image Processing
- Business Intelligence

INRAE - PACA @Avignon

Plant Pathology

- Cindy Morris: *coordinator, WP1*
- Christel Leyronas: *WP6*
- Odile Berge • Christel Lacroix • Marc Bardin
- Eric Verdin • Alexandra Schoeny • Cécile Desbiez
- 11 technical staff

Biostatistics and Spatial Processes

- Samuel Soubeyrand: *co-coordinator, WP2*
- Davide Martinetti: *WP3*
- Edith Gabriel: *WP4*
- Denis Allard • Olivier Martin • Hervé Richard
- Associated partner: ESV platform

Ecodevelopment

- Ghislain Géniaux: *WP5*
- Marc Tchamitchian • Rodolphe Sabatier • 1 technical staff

INRAE - Jouy-en-Josas

Applied Mathematics & Informatics from Genome to Environment

- Claire Nédellec • Louise Deléger • Mouhamadou Ba
- Robert Bossy • Valentin Loux • Arnaud Ferré

cirad - La Réunion

Plant Populations and Bioagressors in Tropical Environments

- Virginie Ravigné • Olivier Pruvost • 1 technical staff member

INRAE - Montpellier

Land, Environment, Remote Sensing and Spatial information

- Dino Ienco • Pierre Maurel
- Remi Decoupes • Mathieu Roche
- Maguelonne Teisseire

Biology and Genetics of Plant-Pathogen Interactions

- Claire Neema: *WP7*
- Gaël Thebaud • Sylvie Dallot • Nicolas Sauvion
- Catherine Abadie • Fabienne Ribeyre
- 1 technical staff

INRAE - Clermont Auvergne-Rhone-Alpes

Technologies and Information Systems for Agro-systems

- Sandro Bimonte • François Pinet
- Jean-Pierre Chanet • Associated partner: Univ. Bologna

INRAE - Bordeaux

Fruit Biology and Pathology

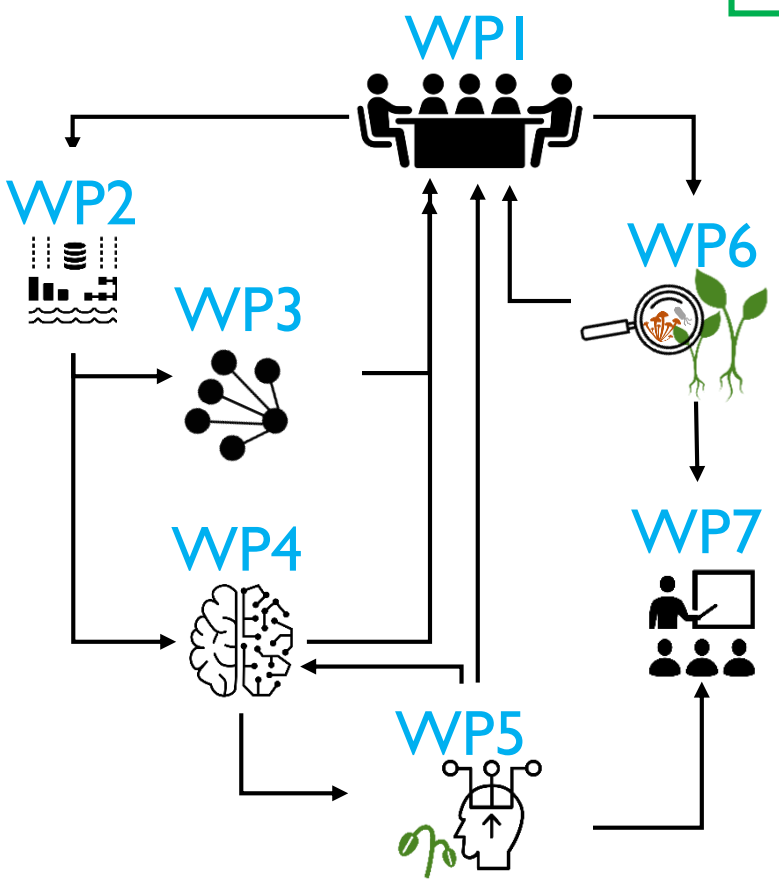
- Sylvie Malembic-Maher • Xavier Foissac
- 1 technical staff
- Associated partner: Groupement de Défense contre les Organismes Nuisibles

Health & Agroecology of Vineyards

- François Delmotte • Frederic Fabre • 1 technical staff member

HOW

7 Work Packages

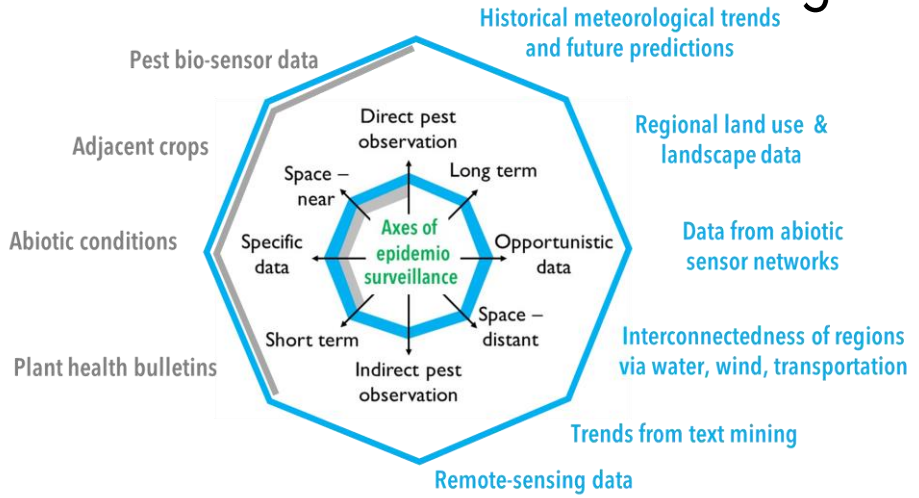


Ample epidemiological data for 8 patho-systems

3 patho-systems

5 patho-systems

Multiple sources of data in these categories

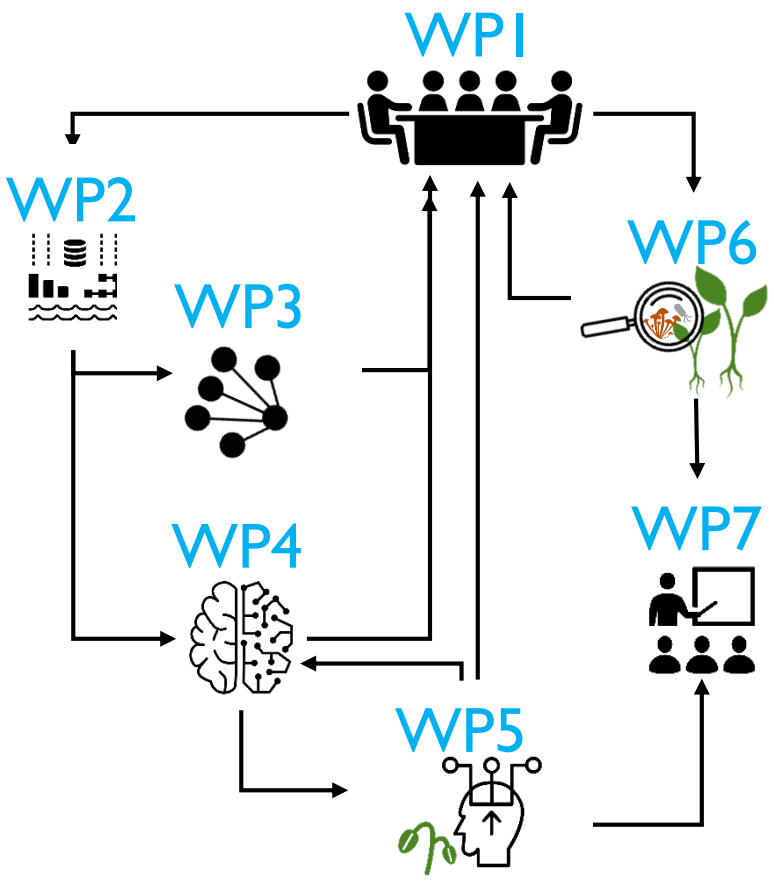


Make new epidemiological indicators

Conceive new opportunities for prophylaxis

Document and transfer experience to 7 other patho-systems

HOW 7 Work Packages



WP2: Web portal of data, services, risk factors & meteorological projections

WP3: Disease surveillance strategies based on network construction and analysis

WP4: Learn & predict risk (AI, machine learning), and optimize surveillance now and in future

WP5: Decipher & describe the decision process for plant health management

WP1: Manage the project's intelligence and interdisciplinarity: identify needs, transfer competence, construct the paradigm

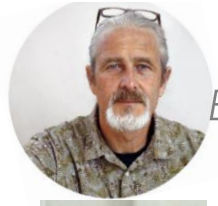
WP6: Develop a guide for designing enhanced ES systems to optimize deployment of prophylaxis in a new age of data availability and scope

WP7: Build capacity for new ES via training

S. Soubeyrand
BioSP - Avignon

D. Martinetti
BioSP - Avignon

E. Gabriel
BioSP - Avignon


G. Géniaux
Ecodev - Avignon

C.E. Morris
PV- Avignon

C. Leyronas
PV- Avignon

C. Neema
BGPI/PHIM-SupAgro

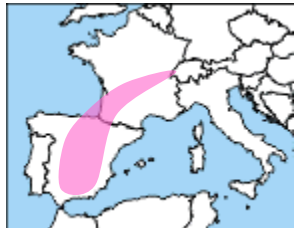
INDICATORS THAT BEYOND CONTRIBUTES TO A FUTURE w/o PESTICIDES

Plateforme ESV

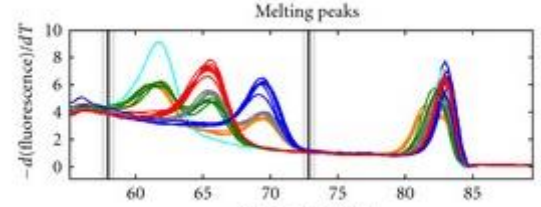
Epidémiosurveillance Santé Végétale

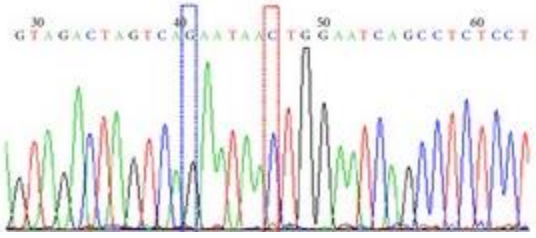
Official surveillance schemes

- co-constructed with stakeholders
- evaluated by technical institutes



Regional partnerships to reduce inter-flux of pests



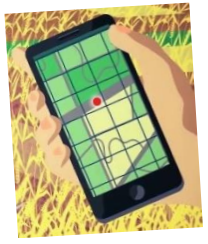


Diagnostics to gage pathogenic potential

Risk maps

Technical documents

Trainees



Decision support systems

For more details about BEYOND, contact

cindy.morris@inrae.fr
samuel.soubeyrand@inrae.fr

and visit our website (end of 2020, early 2021):

https://www6.inrae.fr/beyond