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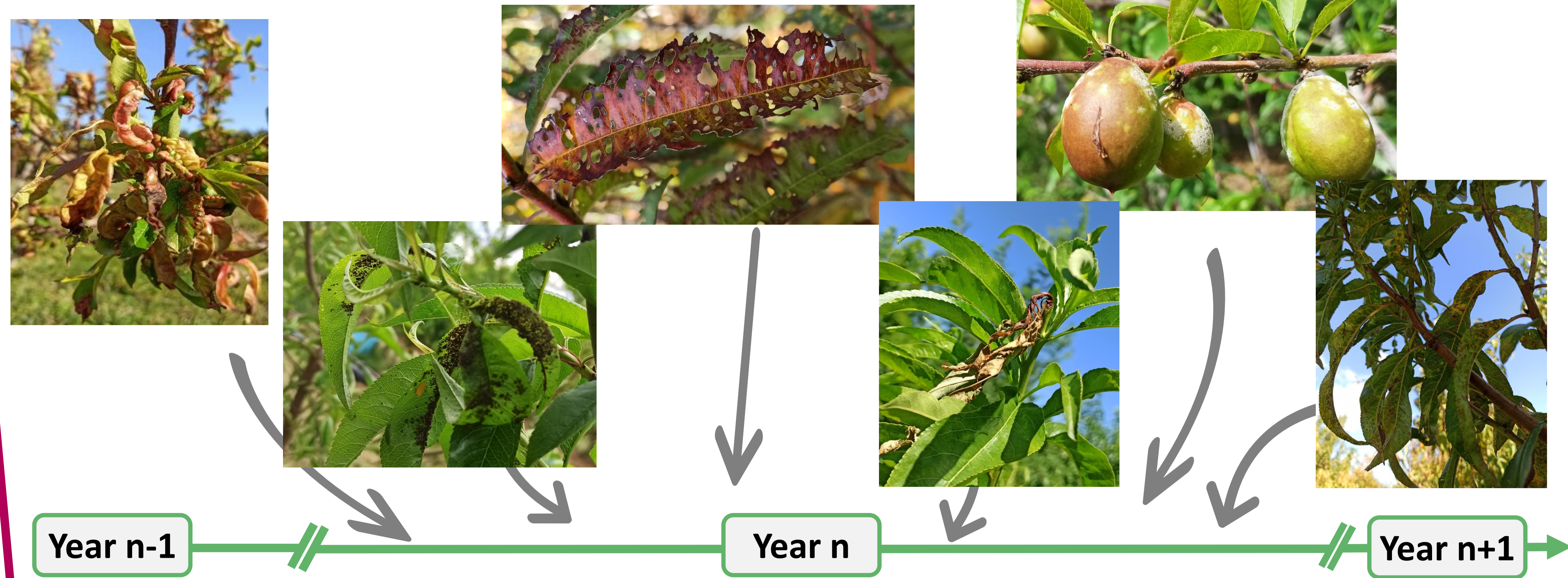
HAL Authorization

# Deciphering plant resilience mechanisms to face the multiple disease challenge in fruit trees

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In current cultivated orchards:

- Fluctuating pressures of multiple pests and diseases
- Cumulative effects over the years
- Lack of multi-resistant varieties

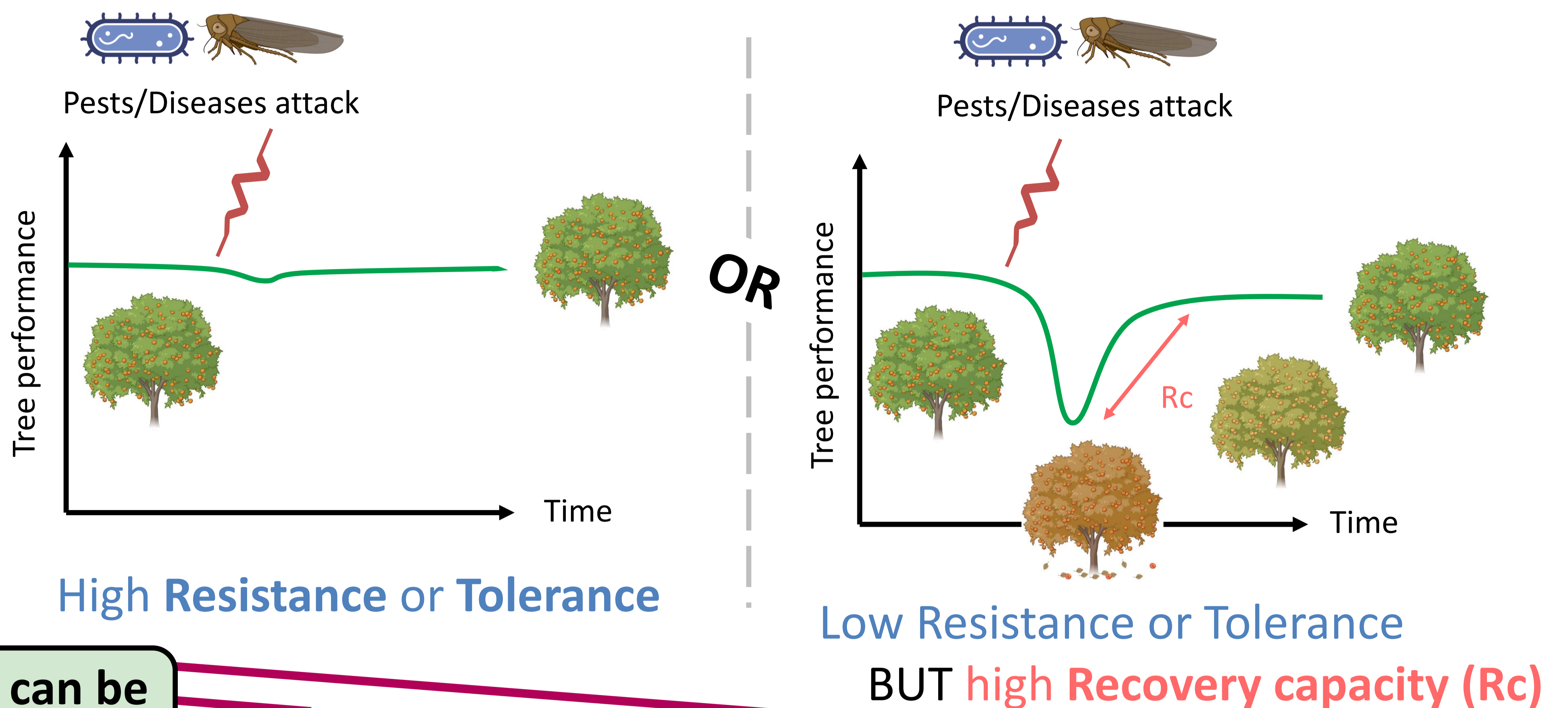
High dependence on phytosanitary products

Could disease resilience, as a key component of plant immunity, be relevant to study tree survival and fitness in this context?

## Disease resilient tree

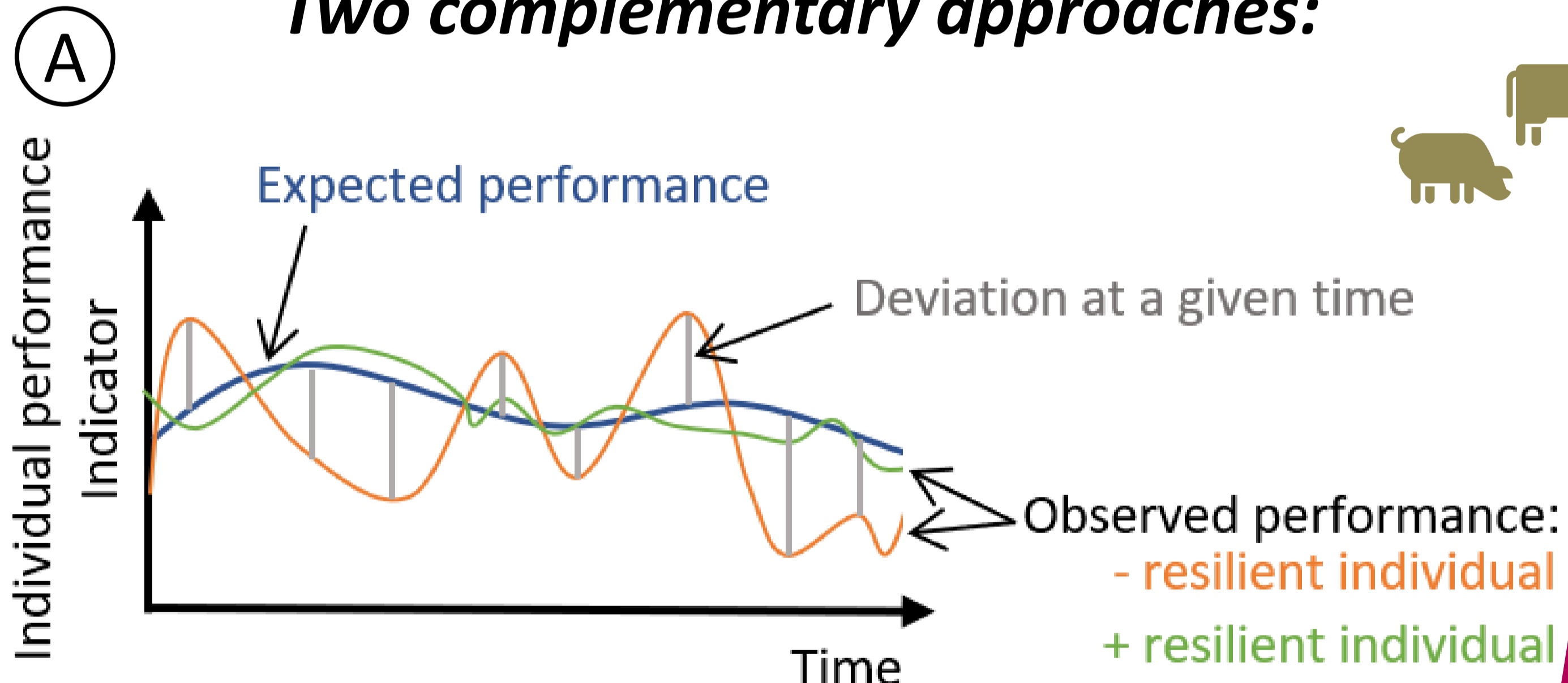
Resistance, Tolerance and Recovery interaction

Multiple trajectories over the time involving several biological functions

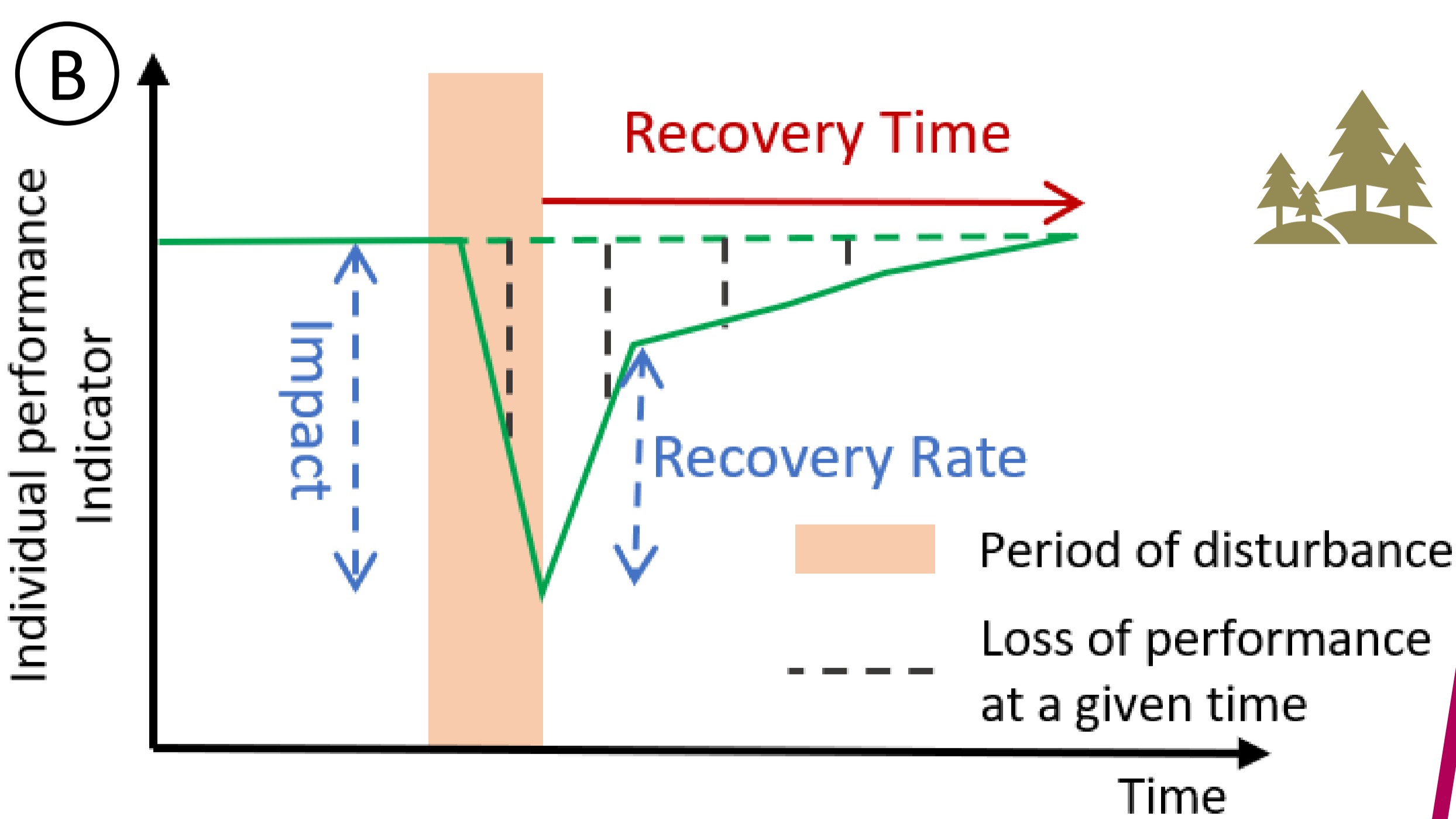


## What metrics of resilience can be found in literature?

Two complementary approaches:



Resilience in livestock<sup>[1]</sup>:  
 Measurement of deviations between expected and observed performance over a period of time



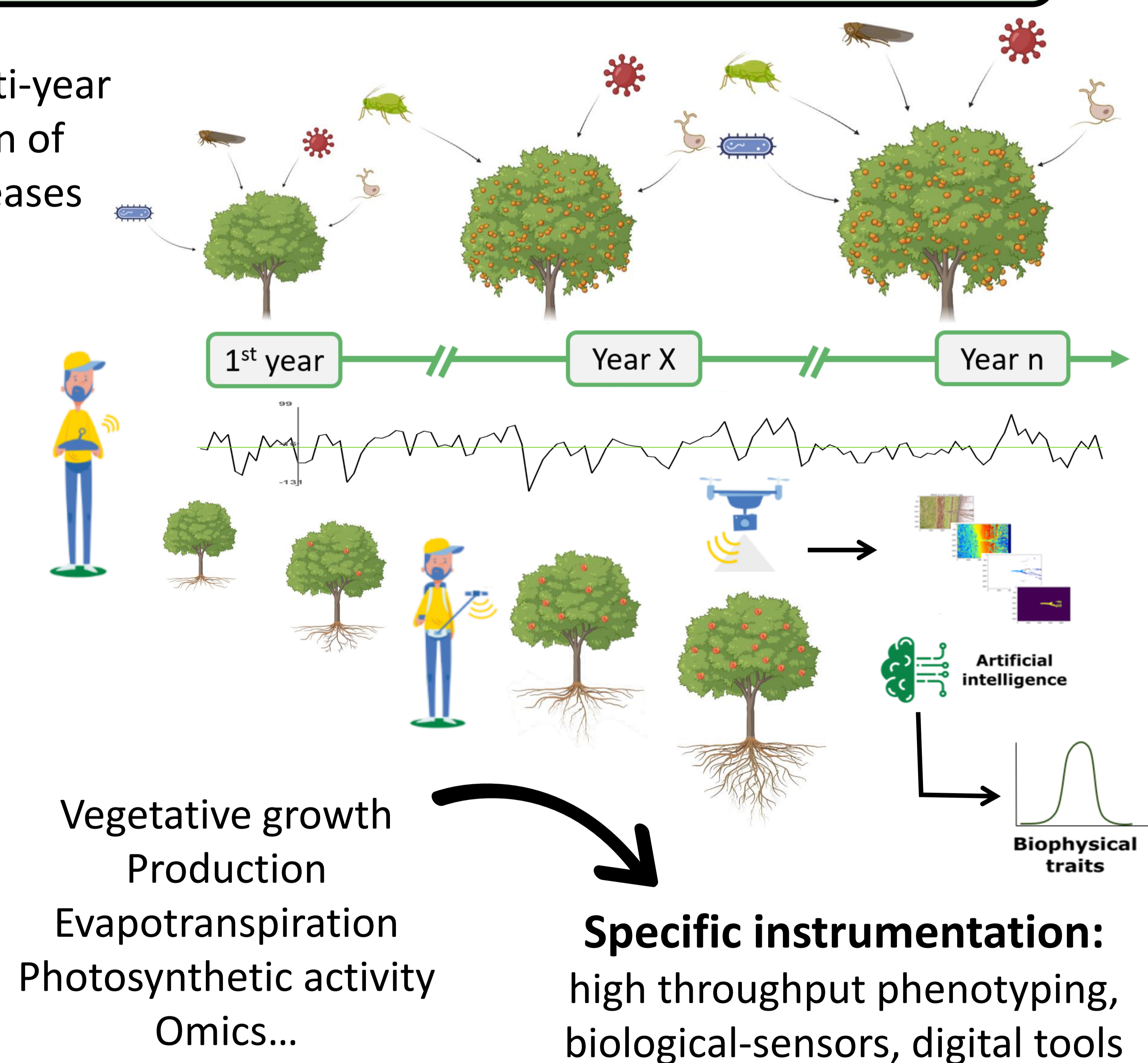
Decomposition of forest resilience into several indicators<sup>[2]</sup>

## How to characterise disease resilience in orchards?

Integrative multi-year quantification of pests and diseases damages

Which are the impacts on tree health?

Temporal measurement of Resilience Biomarkers



Specific instrumentation: high throughput phenotyping, biological-sensors, digital tools

## What is the genetic architecture of disease resilience?

Acquisition of genetic data from large and genetically diverse collections

Genetic analyses: GWAS, genomic or phenomic prediction

Identification of genetic markers linked to disease resilience components

## How to go further?

Let's make disease resilience into a concrete and achievable breeding goal towards resilient ideotypes



[1] Berghof et al. 2019. *Frontiers in genetics* 9, 692.

[2] Lloret et al. 2011. *Oikos* 120(12), 1909-1920; Thurm et al. 2016. *Forest Ecology and Management* 376:205-220.