# Risk management plan Eucalyptus weevil

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CETEMAS
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INSTITUTO SUPERIOR D AGRONOMIA
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UVa

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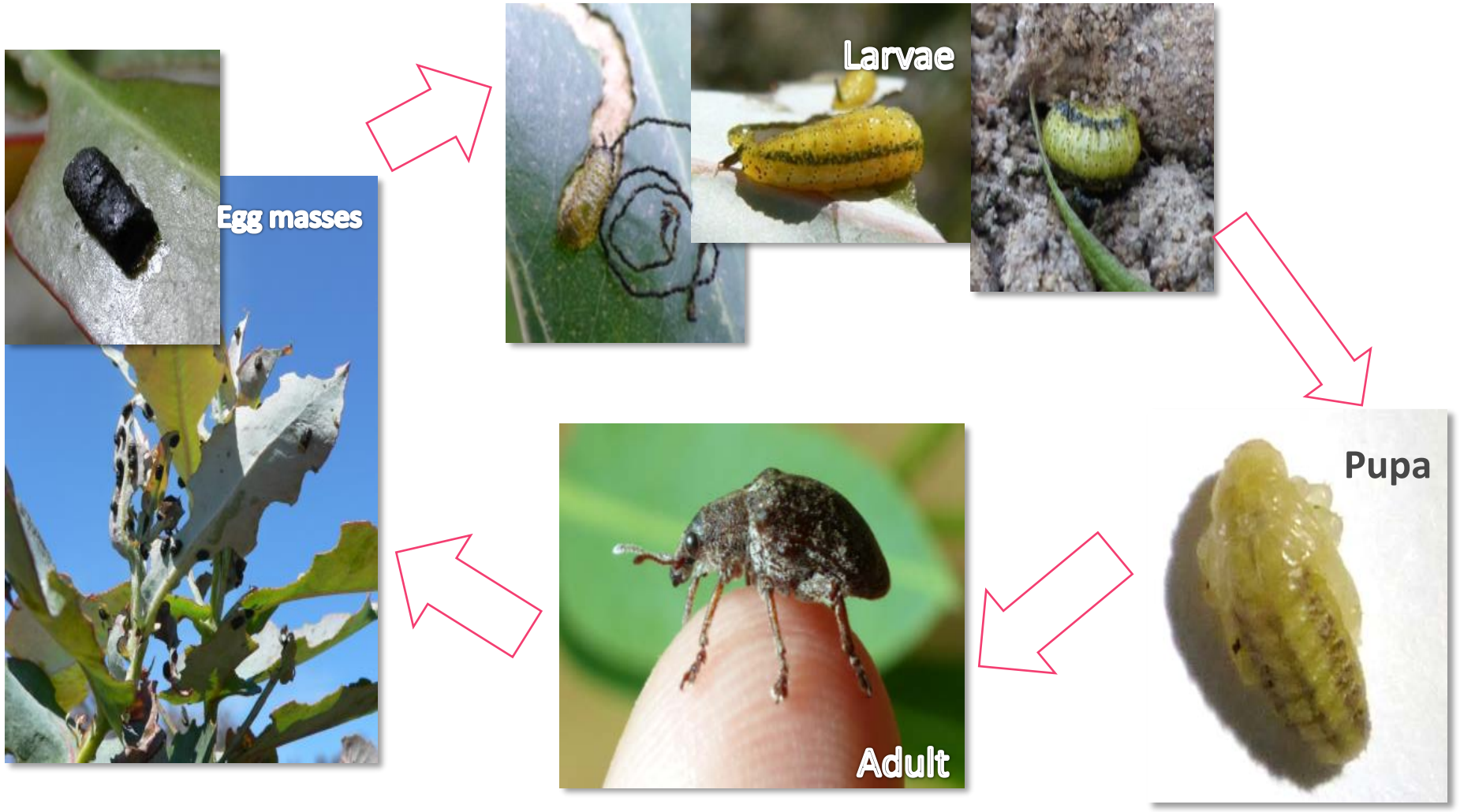
# General information

**The Eucalyptus weevil *Gonipterus platensis*, originate from Tasmania is the main pest problem in Eucalyptus plantations in the Iberian Peninsula**

# General information



# General information

Heavy defoliations, mainly on the upper third of the tree crown

# General information

In most affected areas wood loss reach 100%.
Portugal estimates:

- 1M m3 wood loss per year
- 650M € in the last 20 years.

# General information

Biological Control with *Anaphes nitens* (Hym: Mymaridade) is the main control strategy.

Yet, the parasitoid is not effective everywhere.

However, If the parasitoid had not been introduced, current costs would have been 4 to 11 times higher!

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Analysis

## Economic Outcome of Classical Biological Control: A Case Study on the *Eucalyptus* Snout Beetle, *Gonipterus platensis*, and the Parasitoid *Anaphes nitens*

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ARTICLE INFO

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Biological Invasions
Pest Management
Natural Enemy
Defoliation

ABSTRACT

Despite the importance of invasive pests, few studies address the costs and benefits of the strategies used to control them. The present work assesses the economic impact of the *Eucalyptus* snout beetle, *Gonipterus platensis*, and the benefits resulting from its biological control with *Anaphes nitens* in Portugal, over a 20-year period. Comparisons were made between the real situation (with *A. nitens*) and three scenarios without biological control: 1) replacement of *Eucalyptus globulus* by resistant eucalypts; 2) insecticide use; and 3) offset of yield losses by imported wood. A cost-benefit analysis was performed to evaluate a programme that aimed to accelerate *A. nitens* establishment. Although *A. nitens* provides adequate pest control in several regions, 46% of the area planted with eucalypts is affected by the beetle, causing wood losses of 648 M euros over 20 years. Losses in the three hypothetical scenarios were estimated at 2451 M-7164 M euros, resulting in benefits from biological control of 1803 M–6516 M euros, despite the fact that only partial success was achieved. Anticipating biological control by just one, two, or three years resulted in benefit-cost ratios of 67, 190, and 347, respectively. Because nonmarket values were not accounted for, these figures are likely underestimated.

# Transnational geographical scope

# Legislative framework

No specific legislation regarding *G. platensis*

General legislation for pests and diseases applies

# Governance

**National and Regional Administration, Research Institutions**

**Portugal**

- ICNF – Instituto Conservação da Natureza e Florestas
- DGAV – Direção-Geral de Agricultura e Veterinária
- INIAV - Instituto Nacional de Investigação Agrária e Veterinária

**Cantabria, Asturias**:

- Sección de Producción y Mejora Forestal de la Dirección General del Medio Natural:
- Dirección General de Desarrollo Rural
- Laboratorio de Sanidad Vegetal
- CETEMAS

# Governance

## Enterprises and Forest Associations

### Portugal

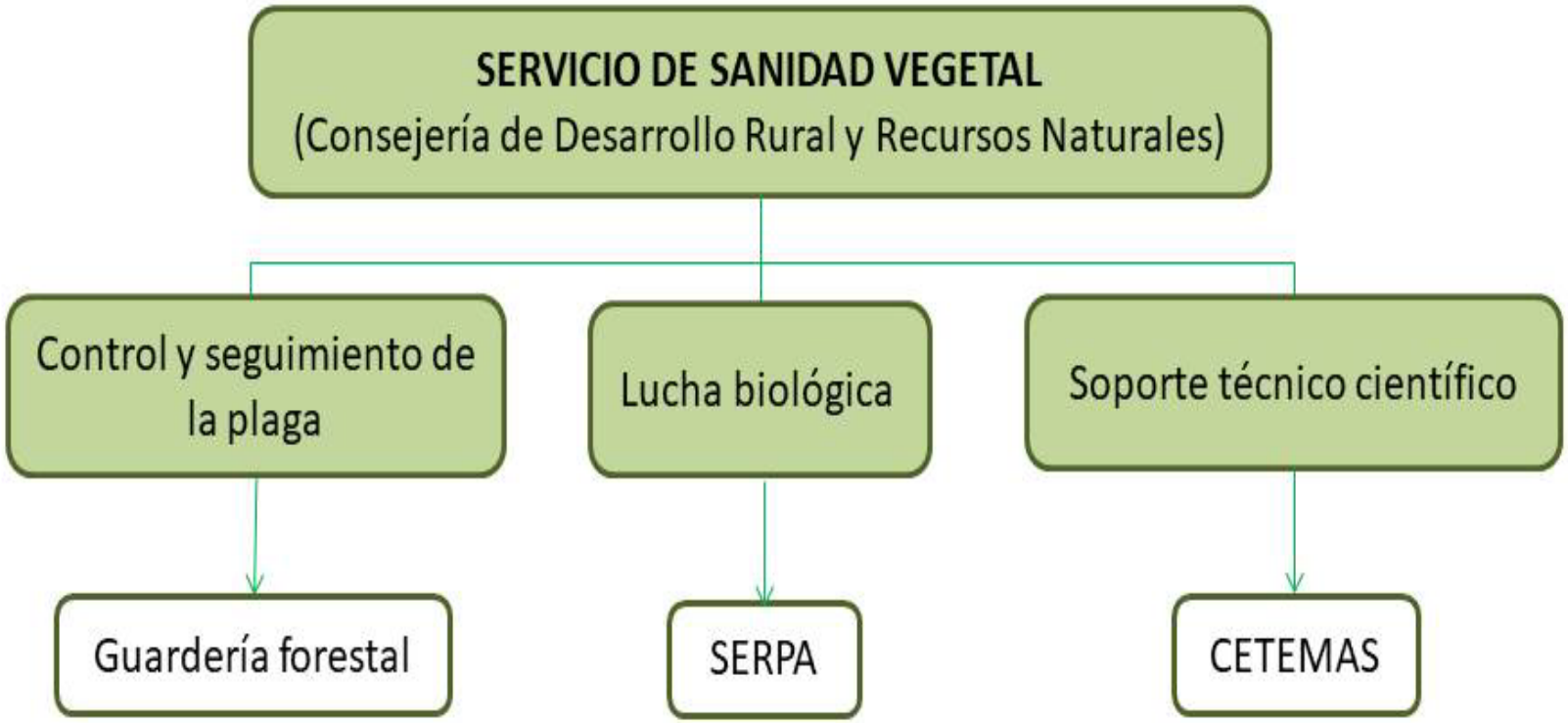
- ALTRI
- RAIZ
- CELPA
- FORESTIS

### Spain

- ENCE
- TRAGSA

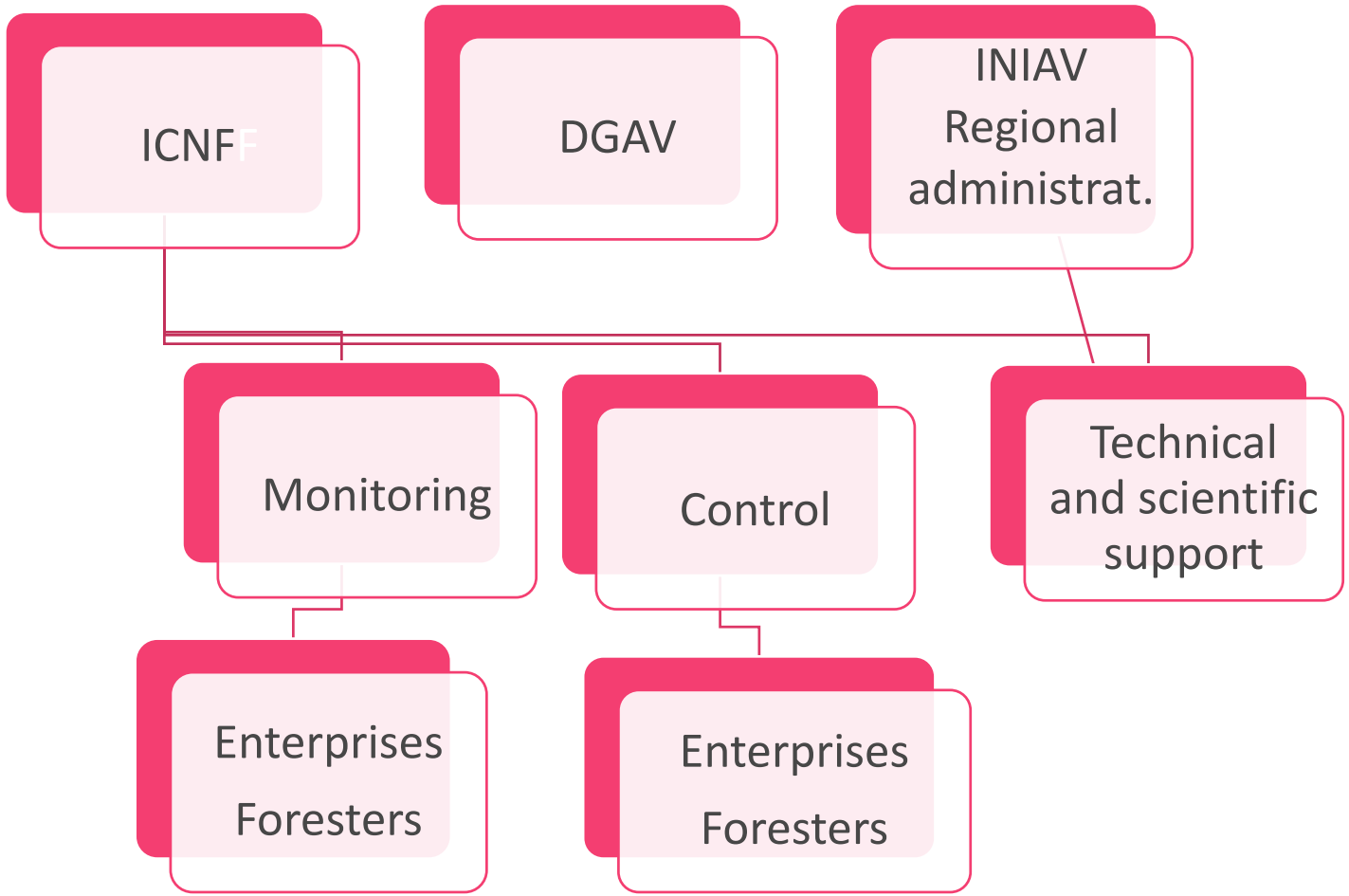
# Governance

## Asturias, Cantabria

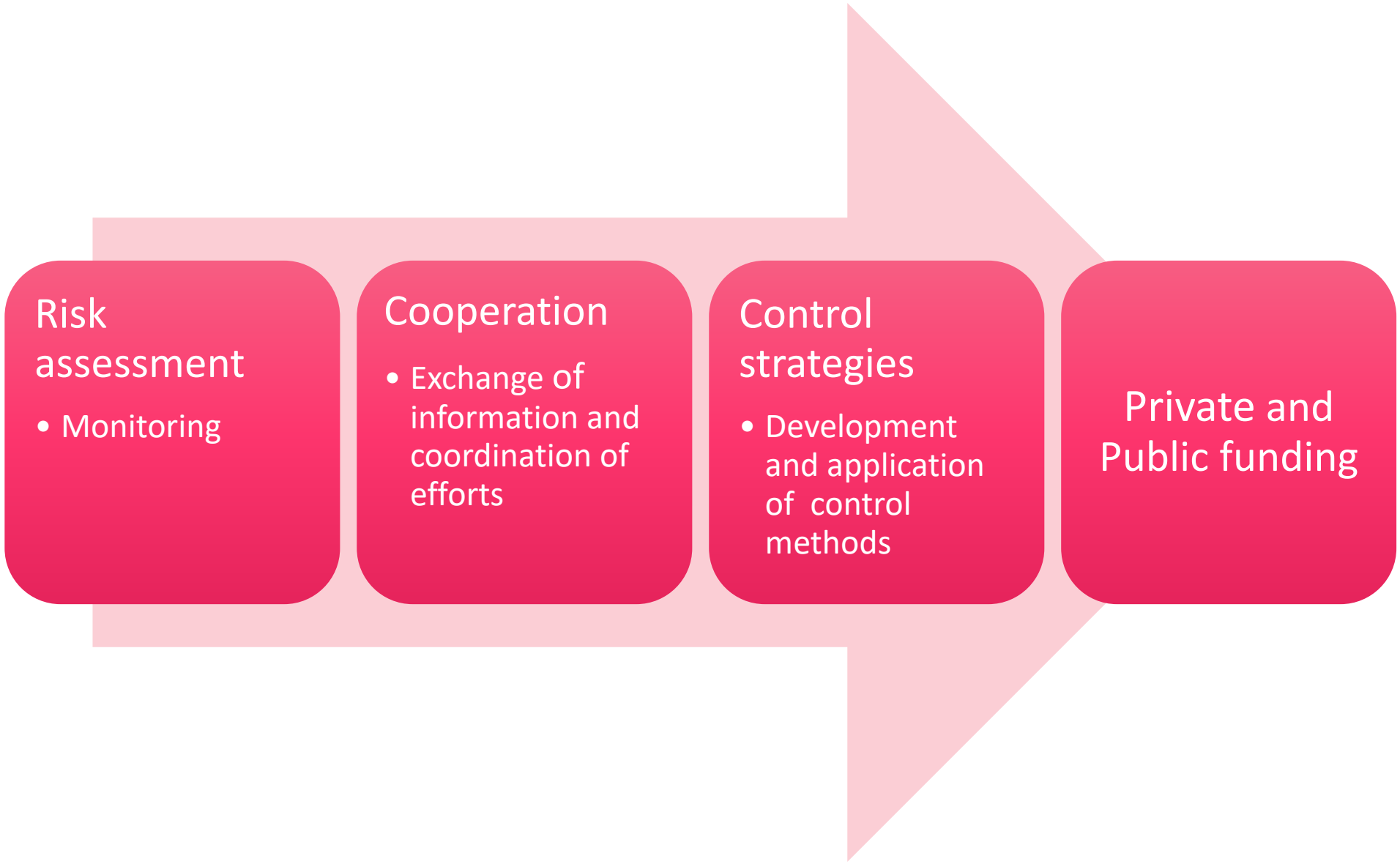


# Governance

## Portugal



# Executive framework

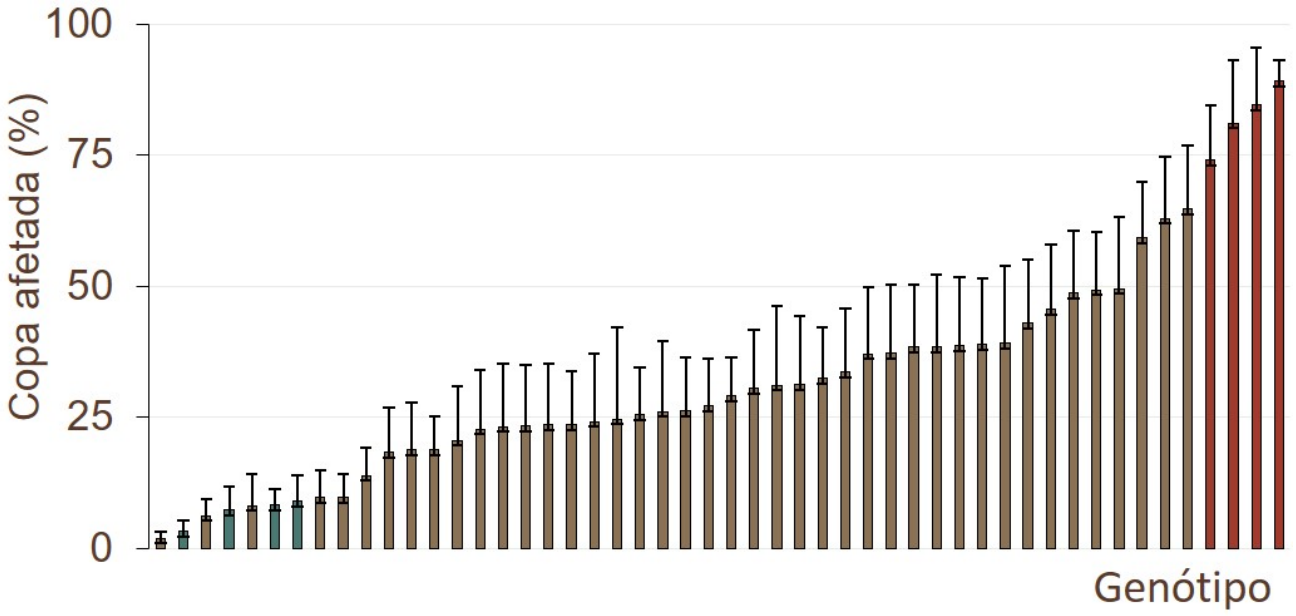


# Detection and identification

# Detection and identification

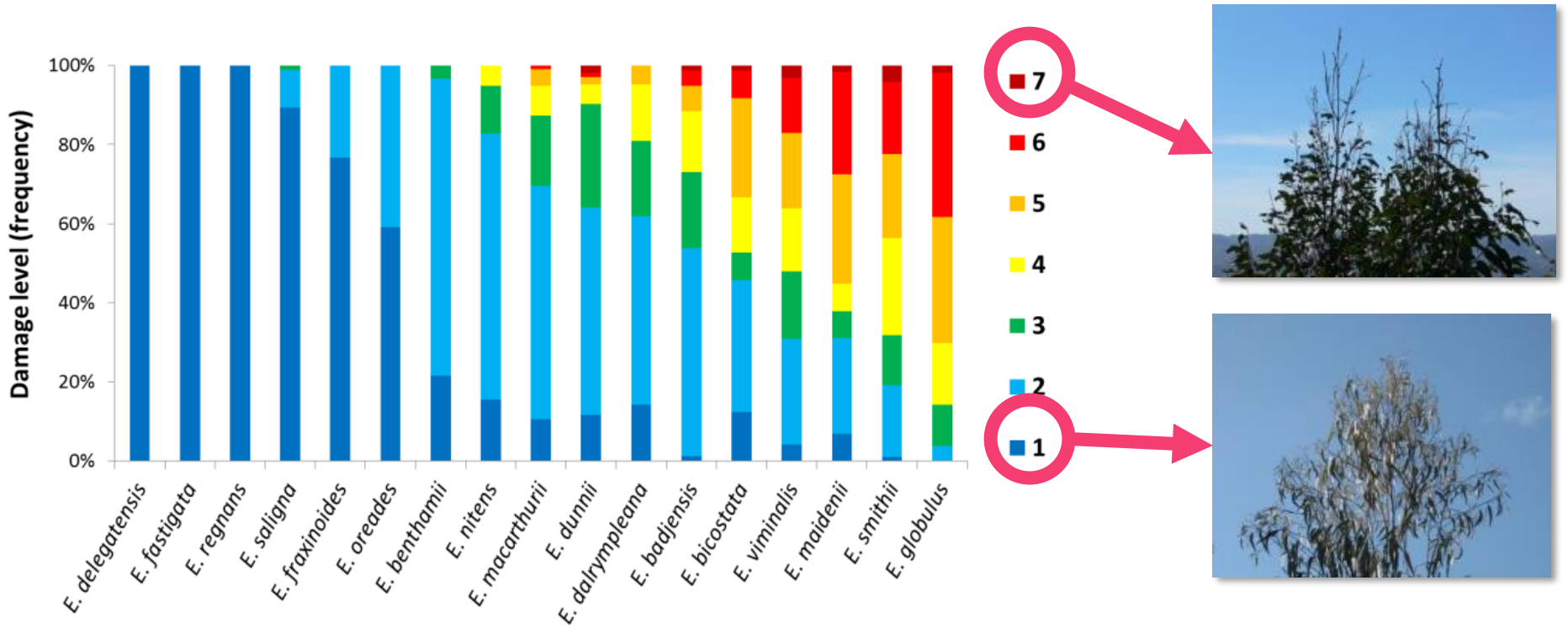
# Prevention

- Select /develop resistant and tolerant genetic materials
- Silvicultural practices




# Eucalyptus selection

- 16 species of *Eucalyptus sp* (45 provenances)



# Monitoring, Surveillance

- Visual surveys, defoliation classes

# Monitoring, Surveillance

- Defoliation level determines pest management decision
- Monitoring is crucial!

Management decision, ALTRI Portugal

| Attack intensity | Visual observations | Management decision |
|---|---|---|
| Without attack | No signs | No intervention |
| Weak attack | <20% defoliation | Continue monitoring |
| Medium | 20-90% | Control |
| Strong | >90% | Clear cut |

# Management decision (Cantabria)

| DEFOLIATION (%) | NO INTERVENTION | BIOLOGICAL CONTROL | CHEMICAL CONTROL |
|---|---|---|---|
| 0-10 | X | X | |
| 11-25 | | X | |
| 26-45 | | X | X |
| > 46 | X | | X |

Options:

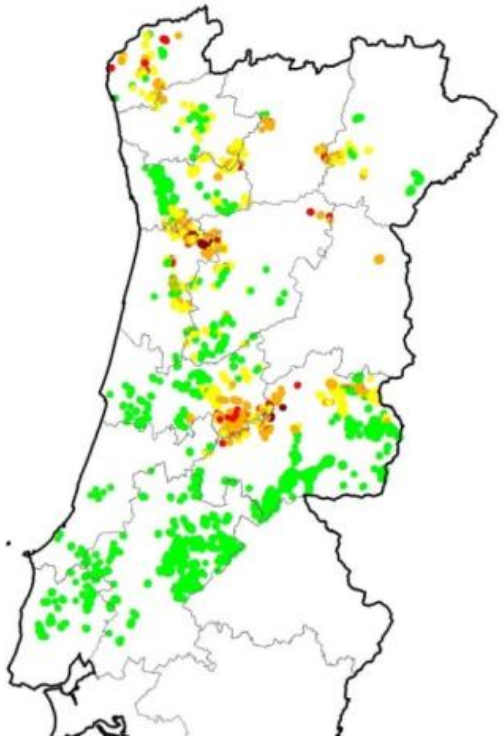
1.- Spraying (backpack sprayer).

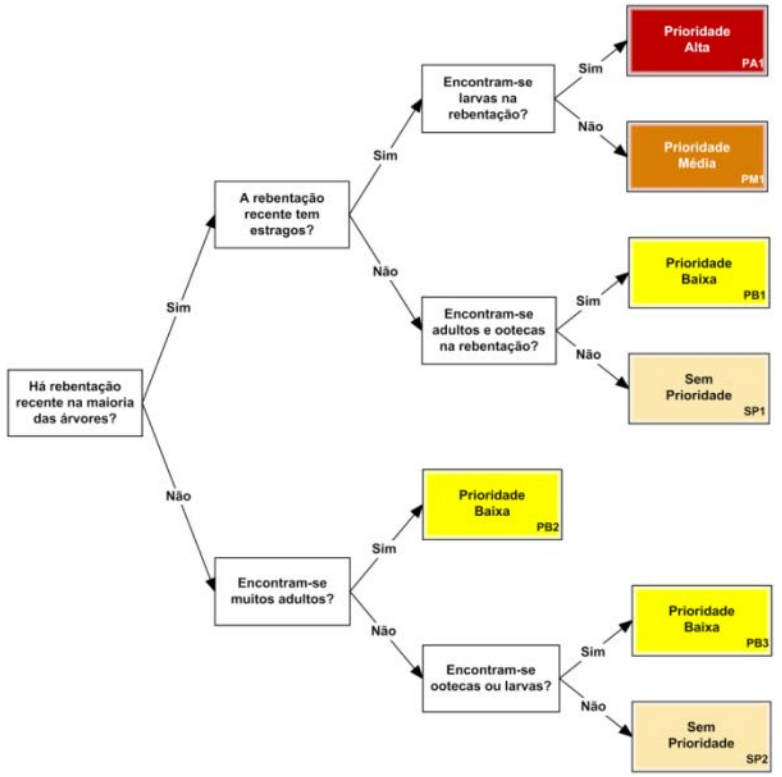
2.- Nebulizer.

3.- Aerial treatments ULV (Ultra Low Volume).

# Management decision control (RAIZ, Portugal)

**Previous year defoliation assessment** → **Monitoring areas at risk** → **Management decision** → **Chemical control**

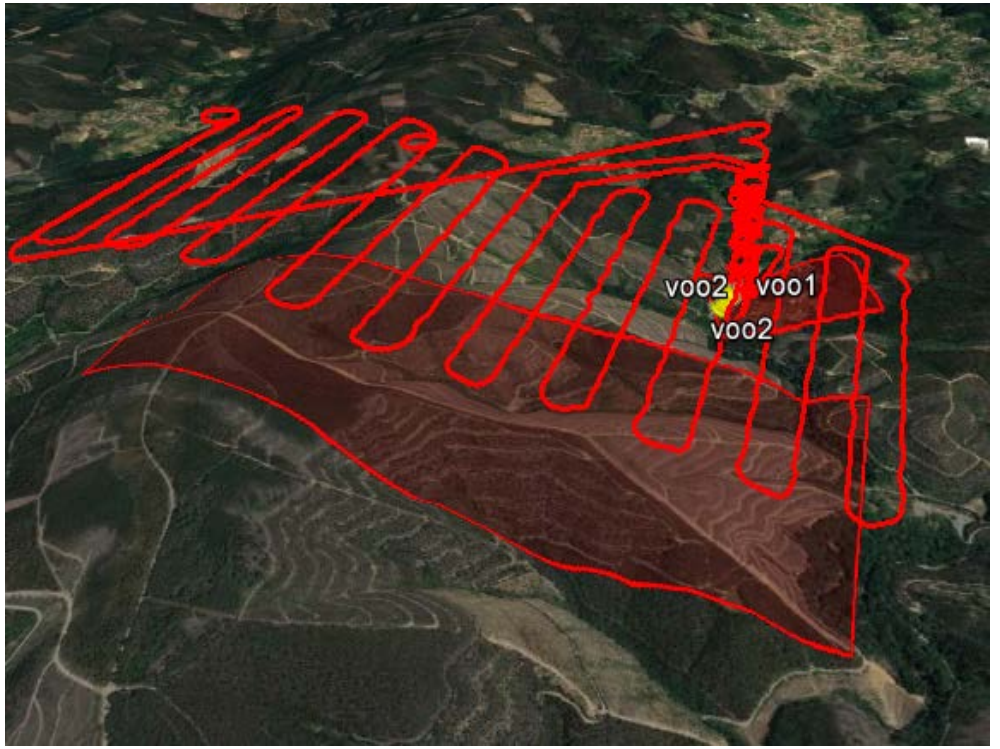





Tools are  needed for monitoring, and to support management decision!

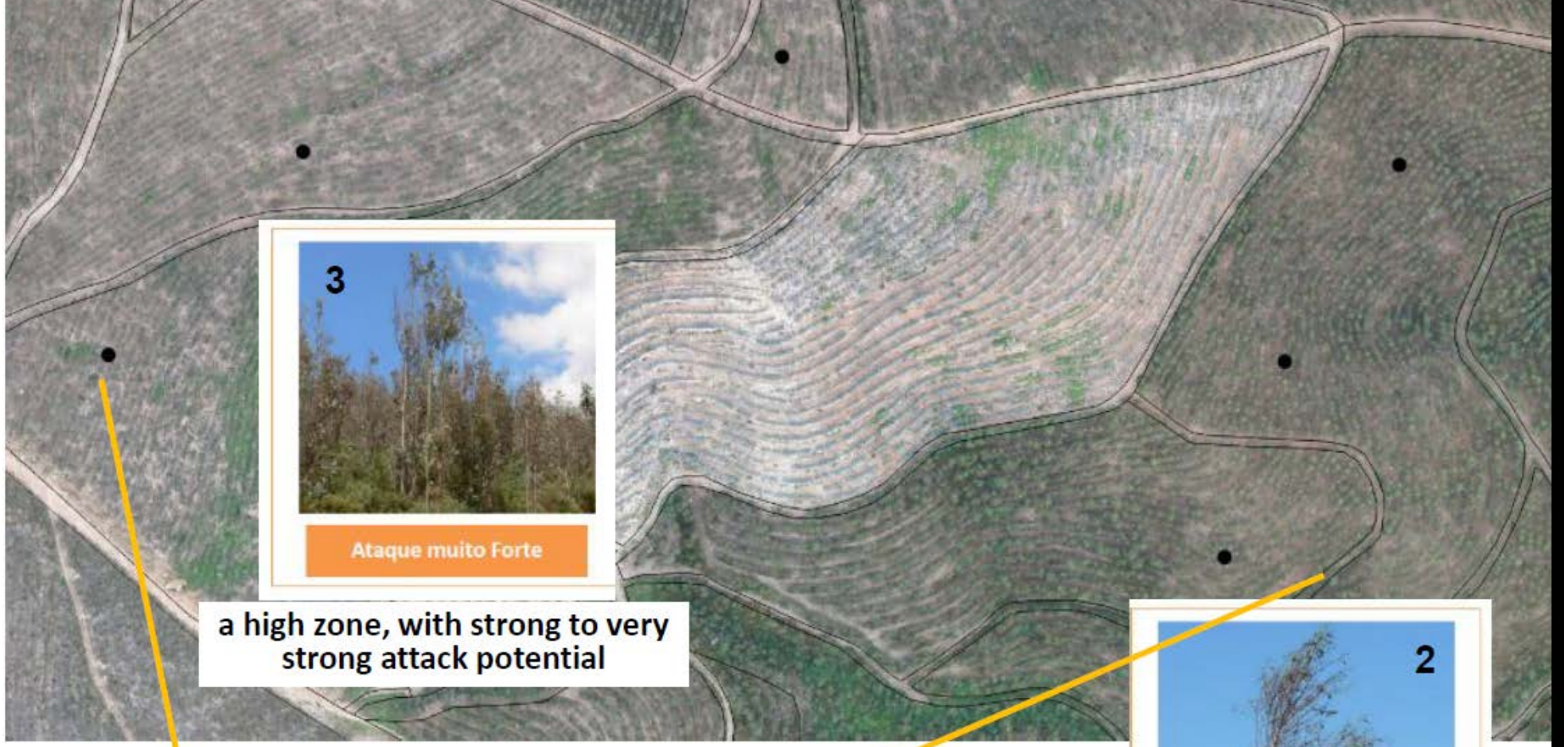
# New Tool From PURIFOR -1

Defoliation assessment through multispectral cameras mounted on UAVs

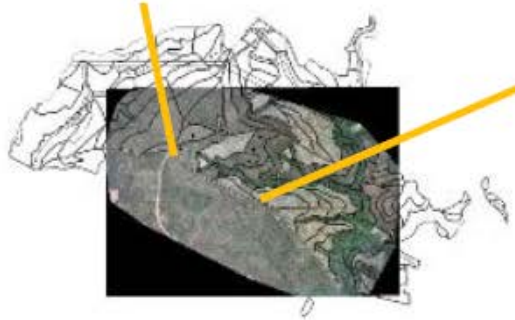



Sensors:

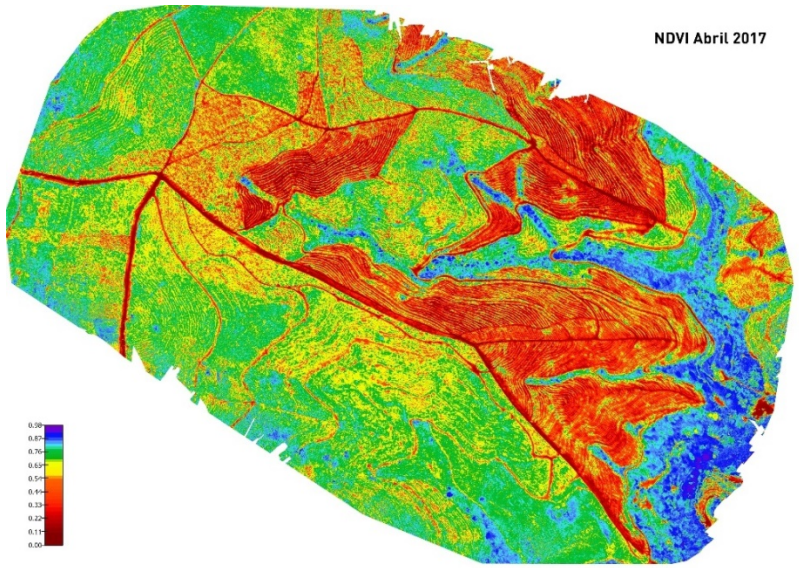
- Multispectral (RGB, Green, Red, NIR, Red Edge)

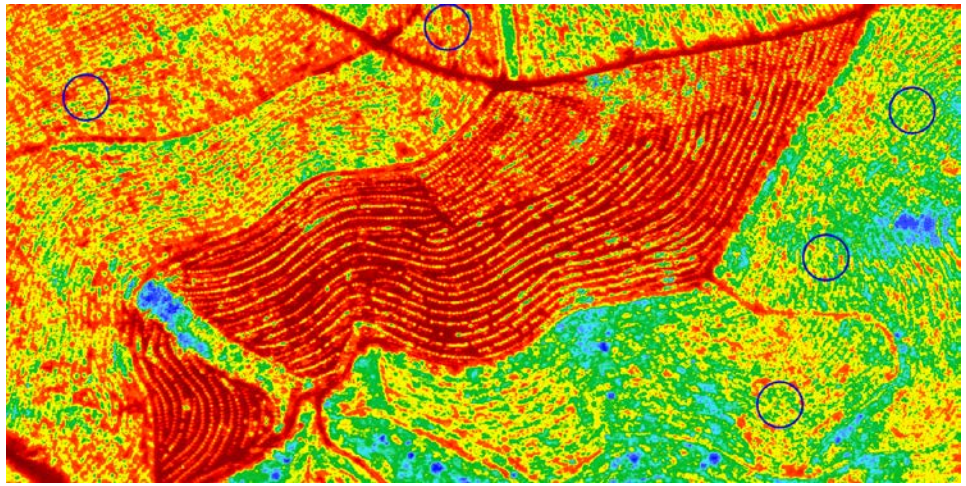


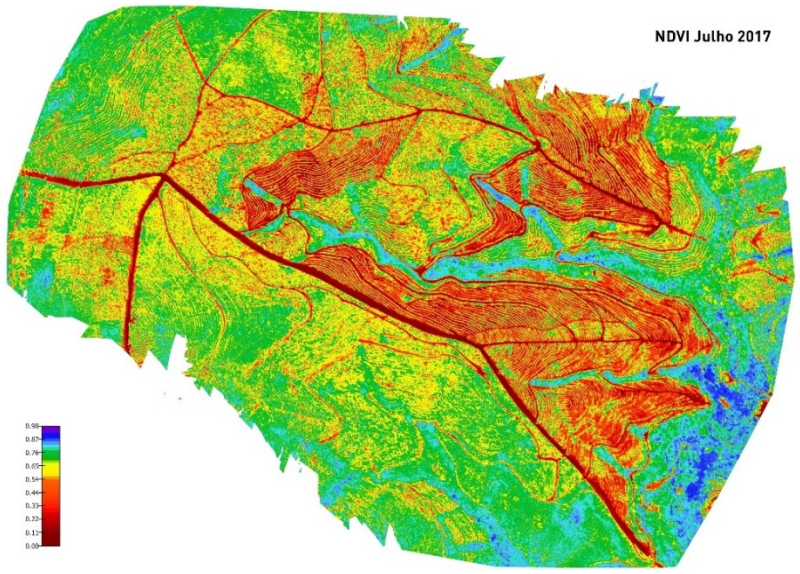

## 2nd rotation stands (coppice) with 6 and 7 yrs old

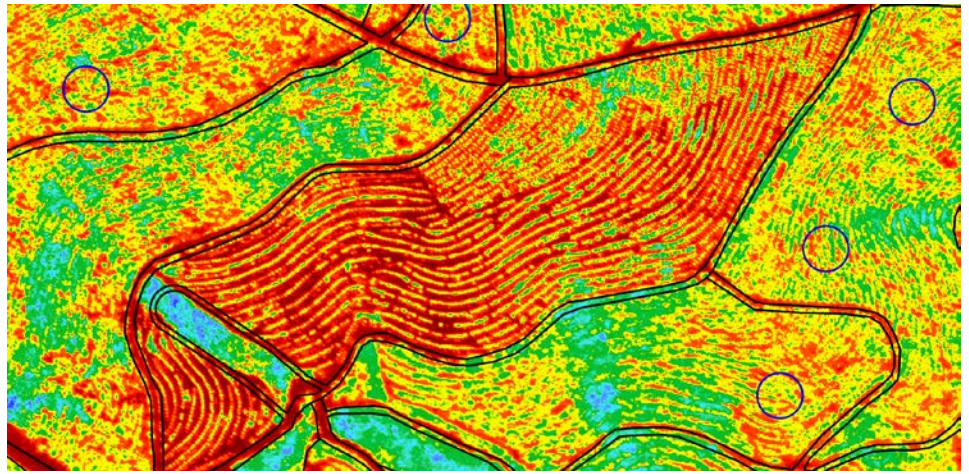


# Classes of defoliation - NDVI April and June 2017, Portugal





# GONIPTERUS PLATENSIS

# DEFOLIATION ASSESMENT THROUGH MULTISPECTRAL CAMERAS MOUNTED ON UAVs

## General information

| | | |
|---|---|---|
| **Description** | A tool to assess and monitor defoliation in eucalyptus stands | |
| **Geographical area** | Eucalyptus distribution area | |
| **Group of tree species** | Eucalyptus species | |
| **Date** | May 2018 | |
| **Authors (affiliation)** | Covadonga Prendes (CETEMAS), Elena Canga (CETEMAS), Juan Majada (CETEMAS), Paula Soares (ISA), Manuela Branco (ISA), Francisco Lario (TRAGSA), Julio Díez (UVA) | |
| **Contact e-mail** | Juan Majada: jmajada@cetemas.es | |
| **Tool type** | Map remote sensing | Case studies |
| **Tool format** | Cartography layers (GIS) | |
| **Language** | English | |
| **Risk management plans to which the tools can be added** | Risk management plans for the eucalyptus weevil from Portugal, Asturias and Cantabria | |
| **Risk management plans link** | [Web links to the risk management plans to which the tools can be added] | |
| **This tool is...** | x a new tool | ☐ an improved tool |
| **Original tool of which this one is an improvement** | [none] | |

# Tool implementation stage and requirements

For the implementation of the tool it will be necessary guidelines for:

- Obtaining the images:
- 1) Platform type;
- 2) Flight parameters - Trajectory, overlap and altitude;
- 3) Sensor type: multispectral images,

- Image processing:

(1) Estimate appropriate indexes to obtain the different levels of defoliation (validated with field observations)

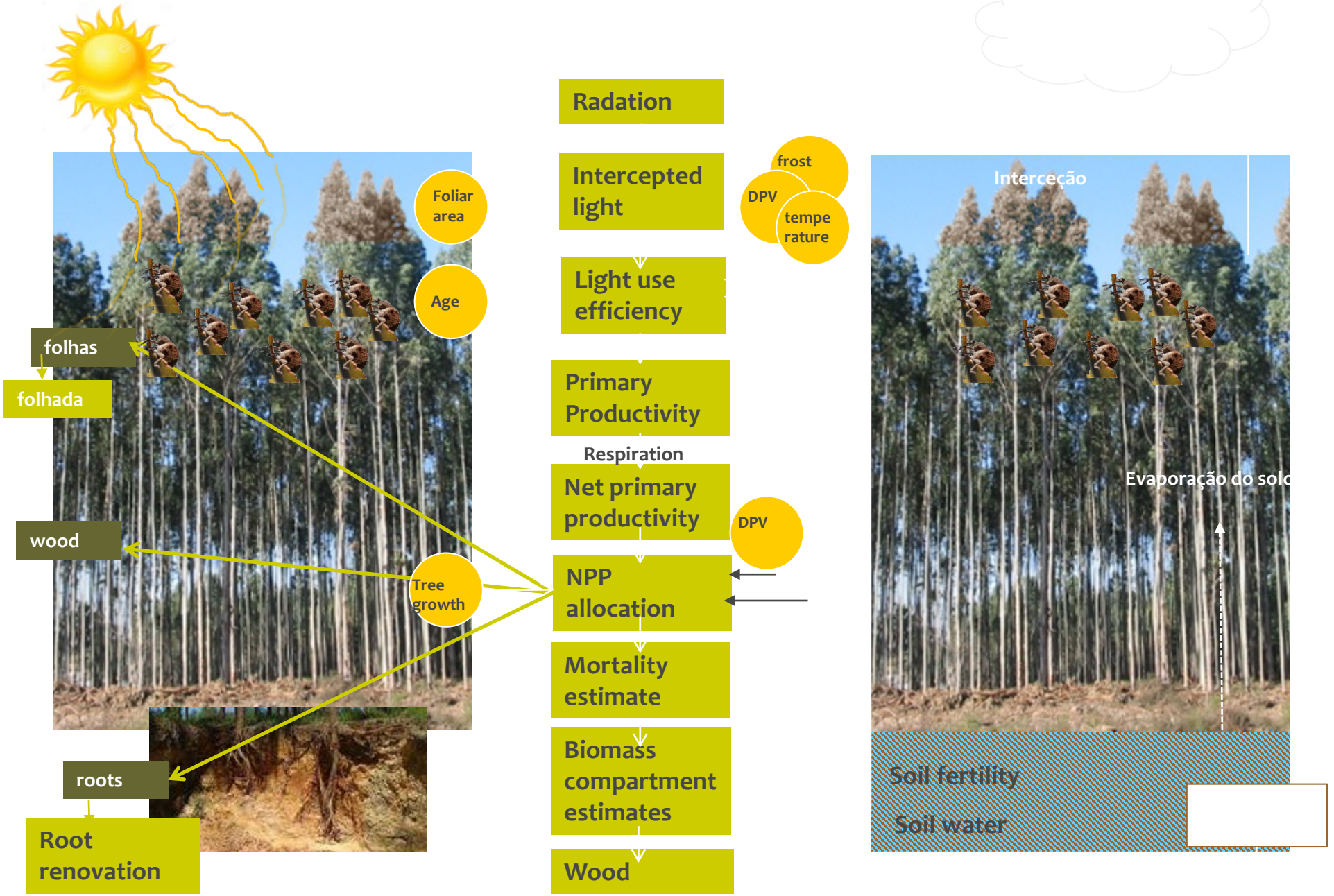
(2) Visualization of information - creation of defoliation maps

# New Tool From PURIFOR - 2

Predicting wood loss under different scenarios using processed-based models

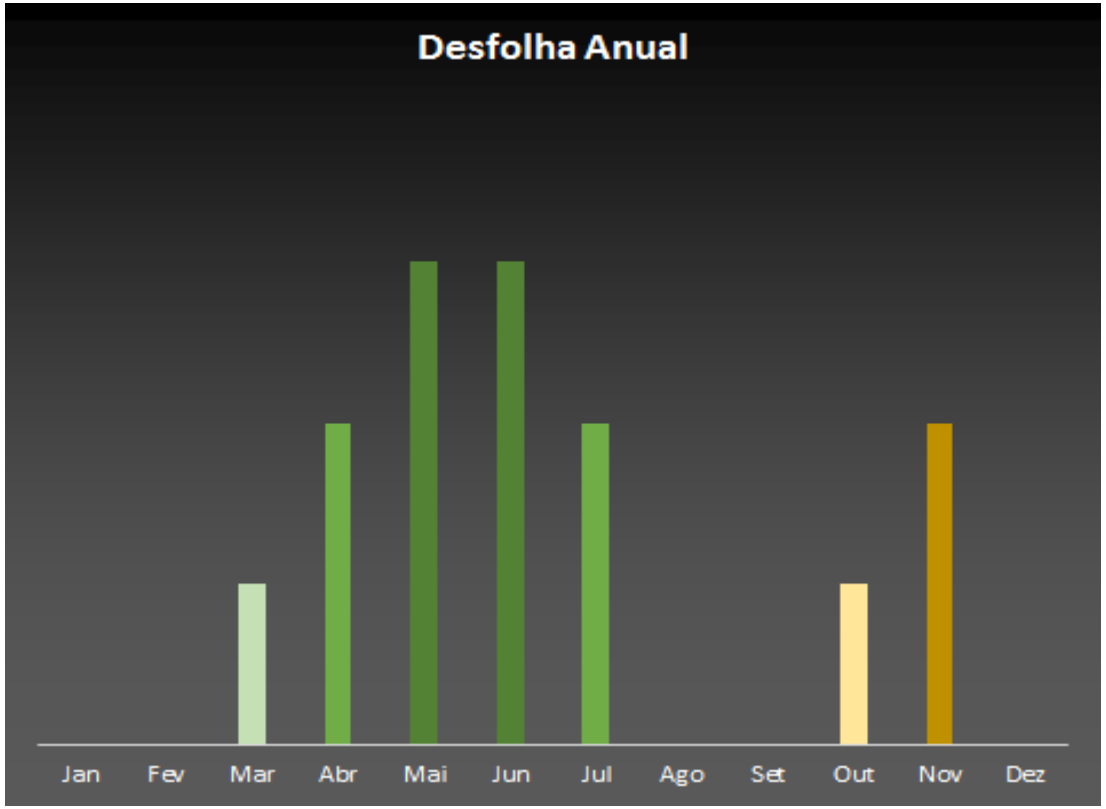
Model:

- 3PG calibrated for *Eucalyptus globulus* Portugal
- Defoliation – empirical data based on field observations
- Scenarios: different treatment strategies


Radation
Intercepted light
frost
DPV
tempe rature
Light use efficiency
Primary Productivity
Respiration
Net primary productivity
DPV
NPP allocation
Mortality estimate
Biomass compartment estimates
Wood
Foliar area
Age
folhas
folhada
wood
Tree growth
roots
Root renovation
Interceção
Evaporação do solo
Soil fertility
Soil water

# CENÁRIOS DE DESFOLHA NO 3-PG

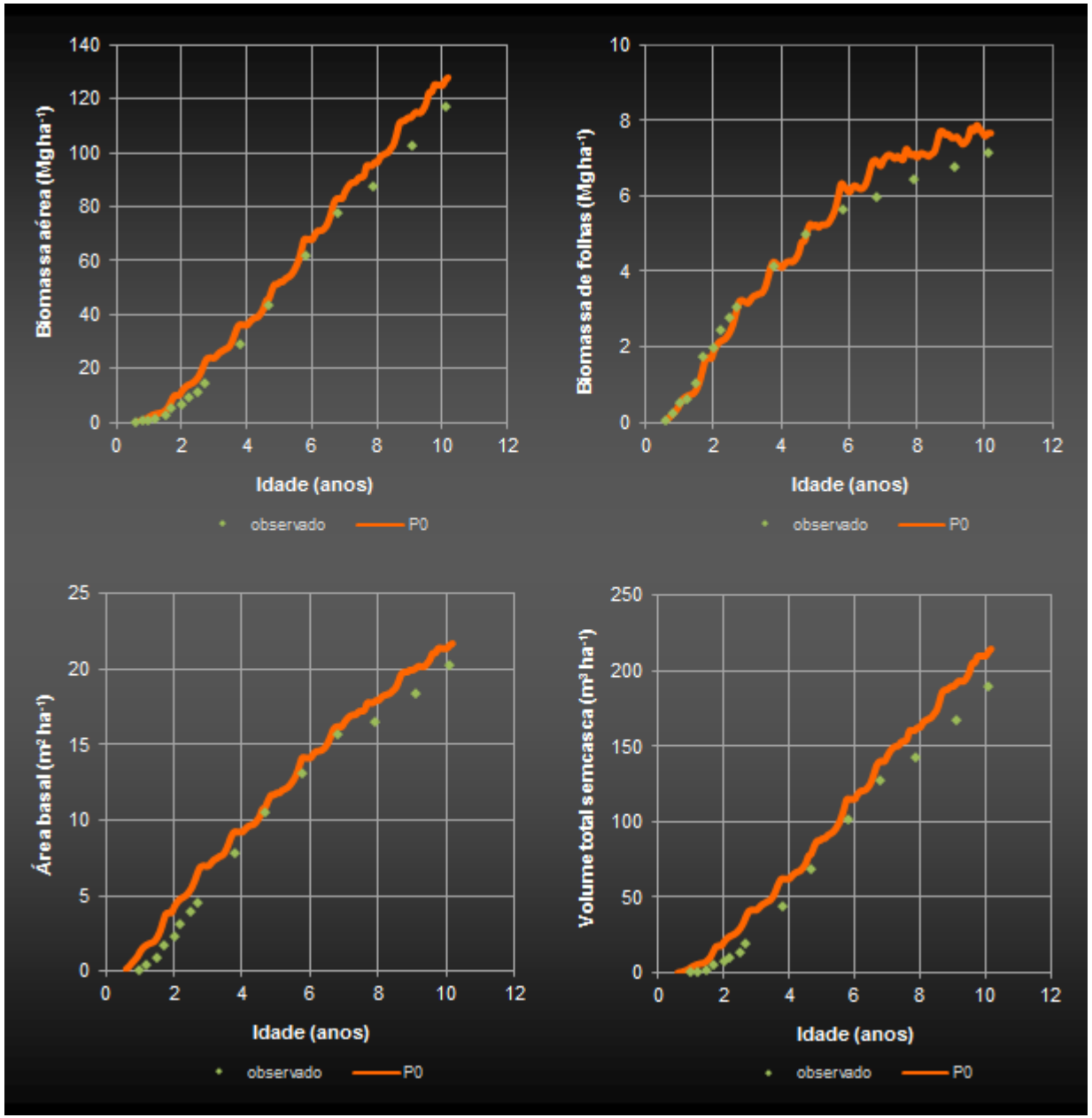
| Anos consecutivos |
| --- |
| Primavera + Outono |
| Cenários |
| PO0 : 0% |
| PO1 : 5% |
| PO2 : 25% |
| PO3 : 50% |
| PO4 : 75% |
| PO5 : 100% |



# CENÁRIOS DE DESFOLHA NO 3-PG

## Anos consecutivos


## Cenário

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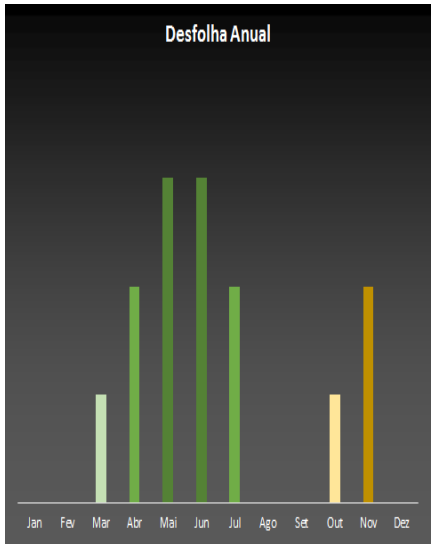


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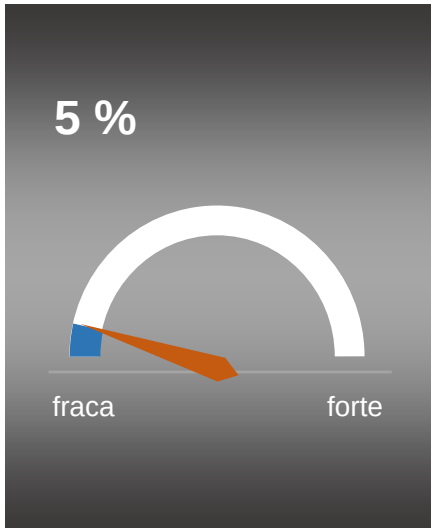


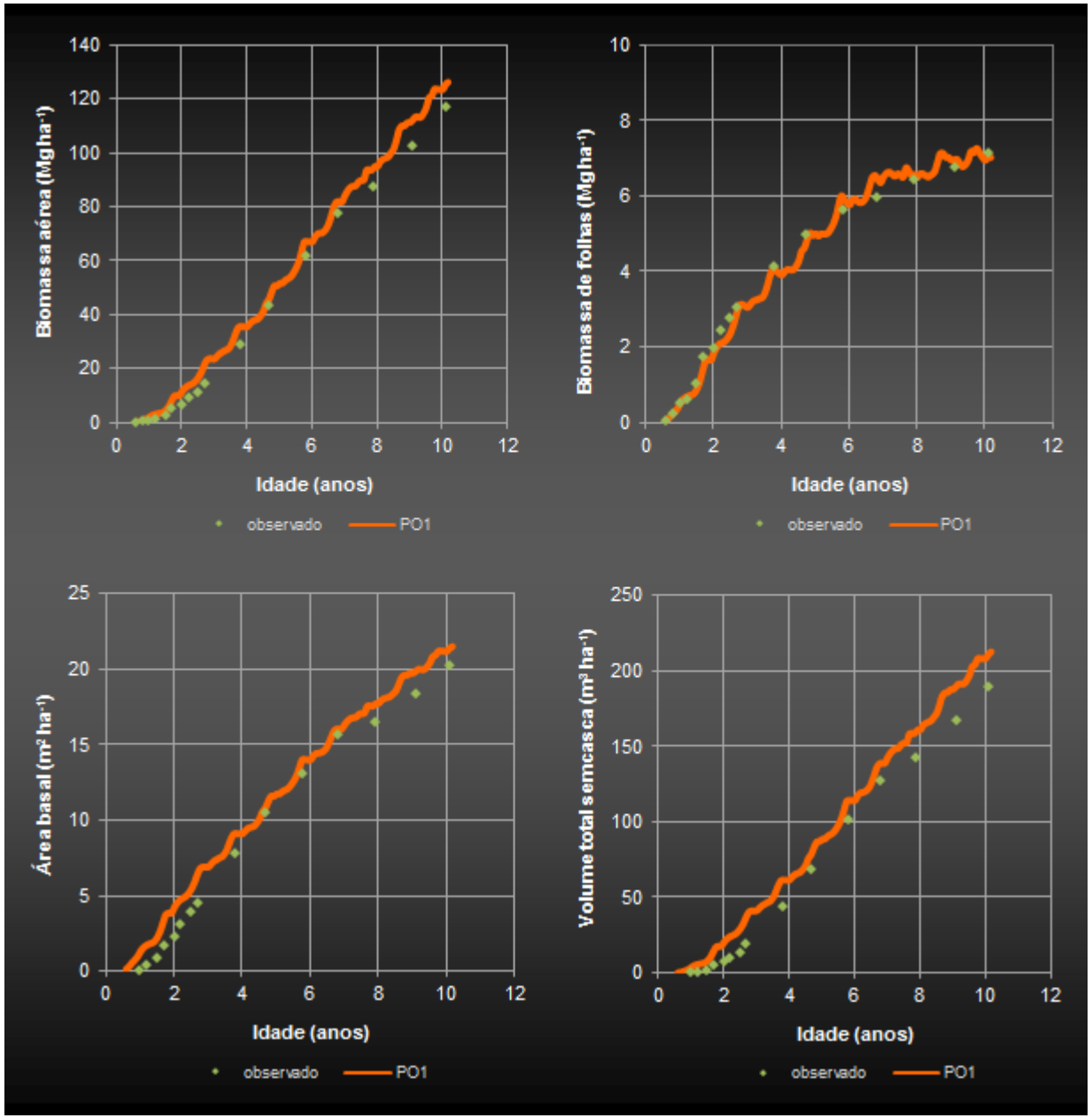

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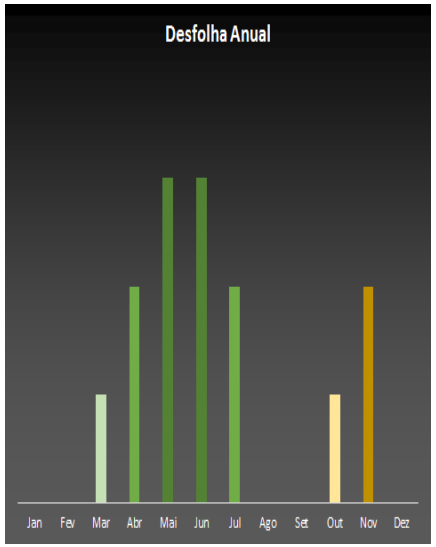


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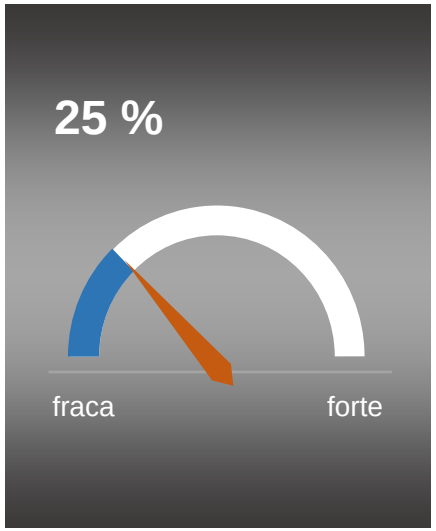


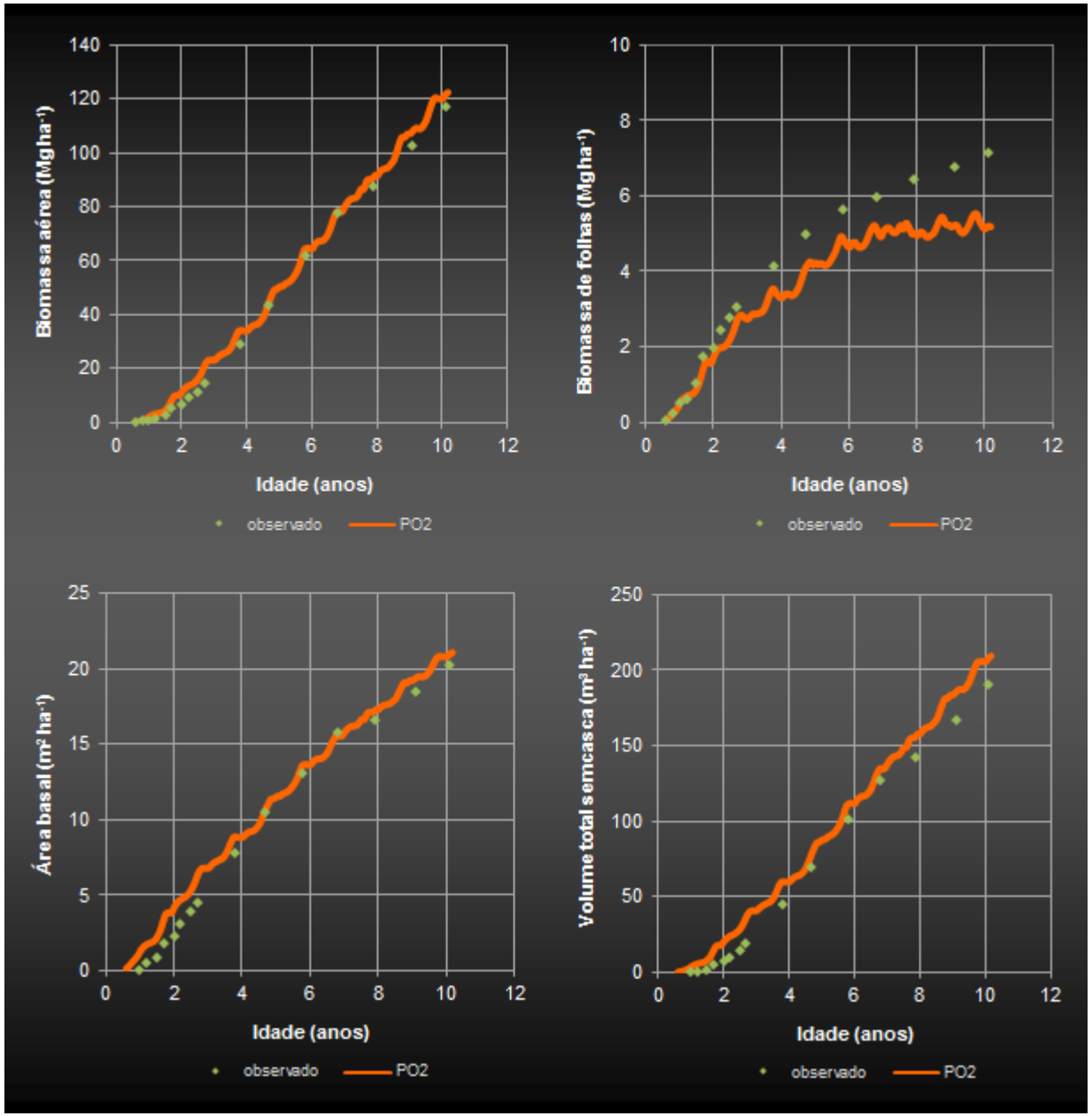

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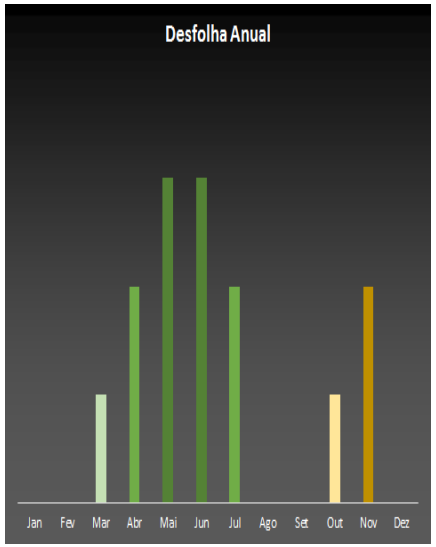


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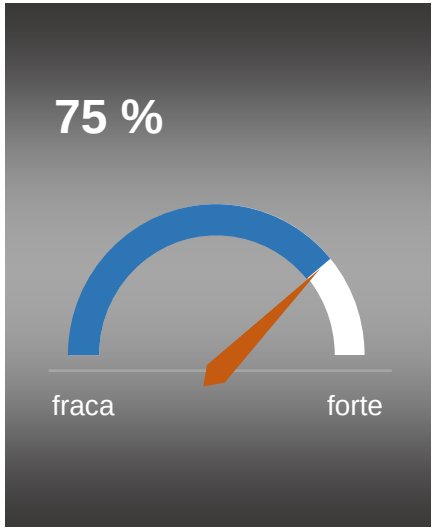


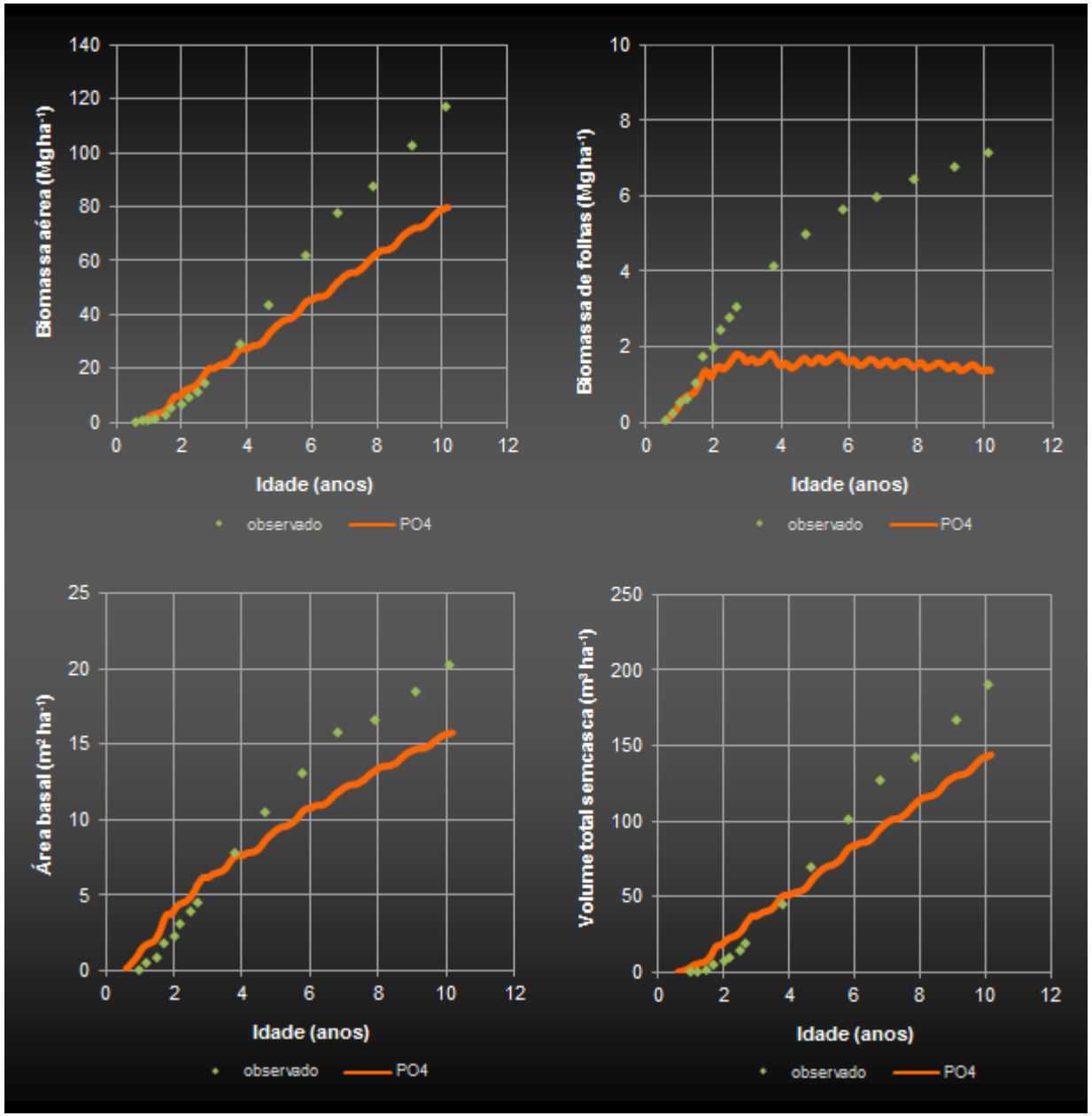

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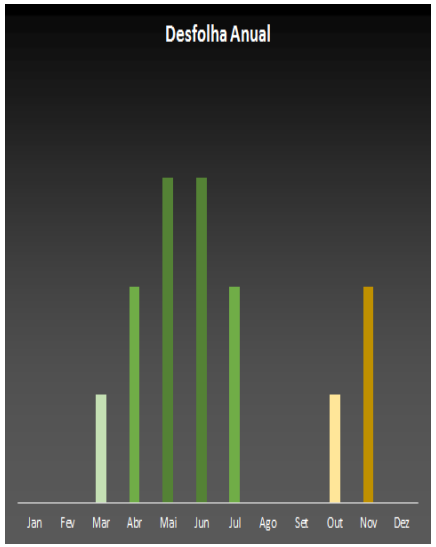


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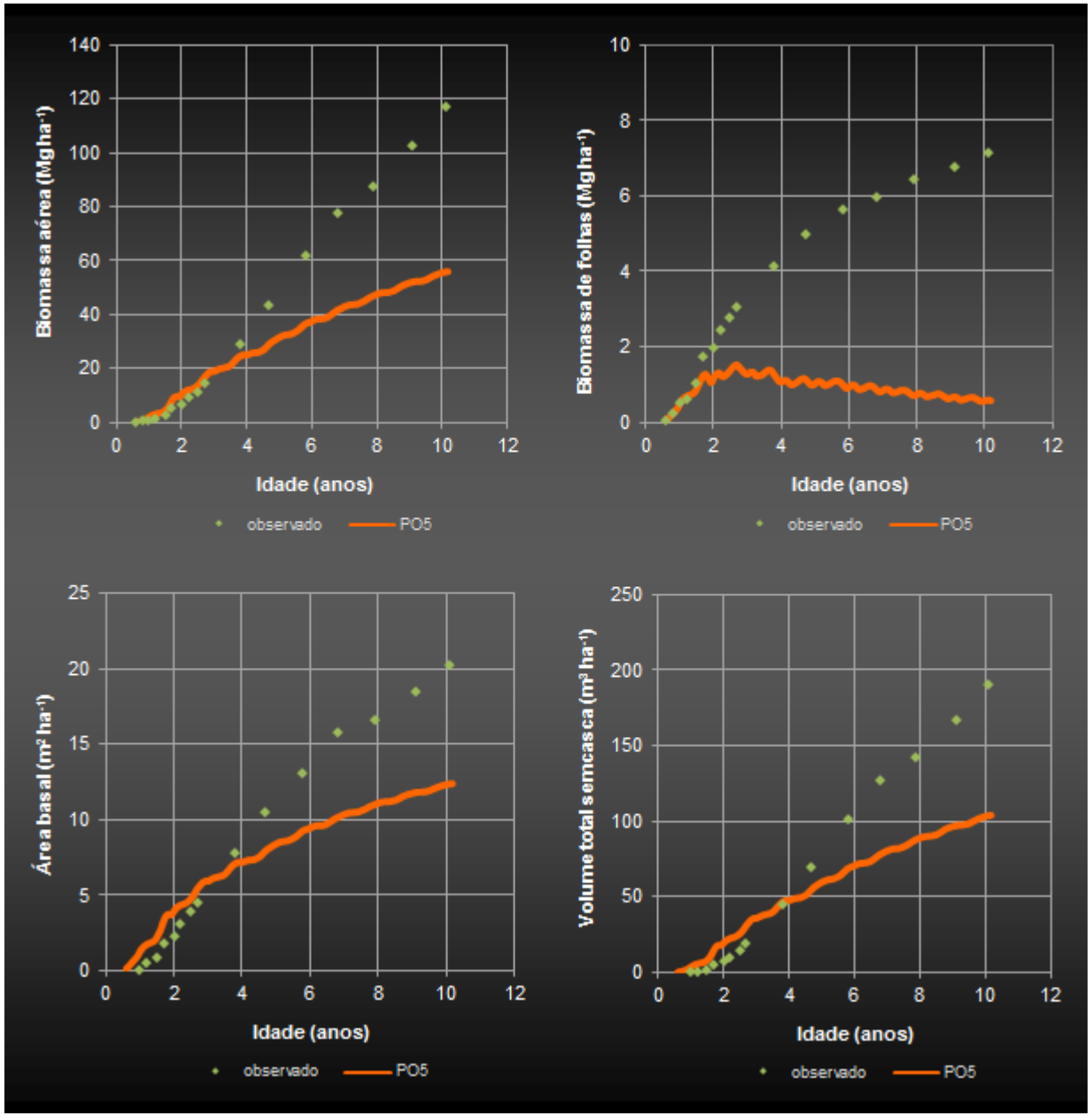


# Control strategies

# Chemical control

Two insecticides are homologated and applied

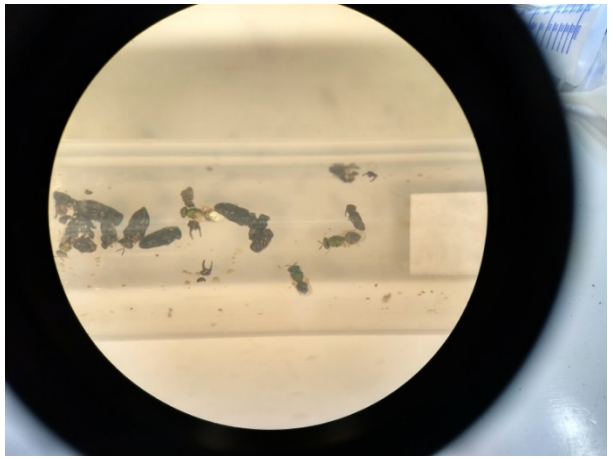
Calypso - tiaclopride
Epik - acetamiprid

# Biological control

Rearing and augmentative release of *Anaphes nitens* (Hym: Mymaridae)

# Biological control

**Second phase measures**: risk assessments for the introduction of **new BC agents** from Australia or Chile





# Rehabilitation/restoration

- Cutting
- Reforestation with resistant material

# Communication Strategy

- Transnational workshops
- Mixed meetings with researchers, technicians and foresters
- Participation in Operational Groups
- Communication between Operational Groups from different regions

# Acknowledgements


- Ana Reis &  Luís Leal  - ALTRI Florestal
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- Ricardo Marinho - Forestis