

# Fogo e Invasoras

# Aliens & Flames

## PDR2020

### AÇÃO 1.1. GRUPOS OPERACIONAIS

#### Iniciativa 168



# Summary

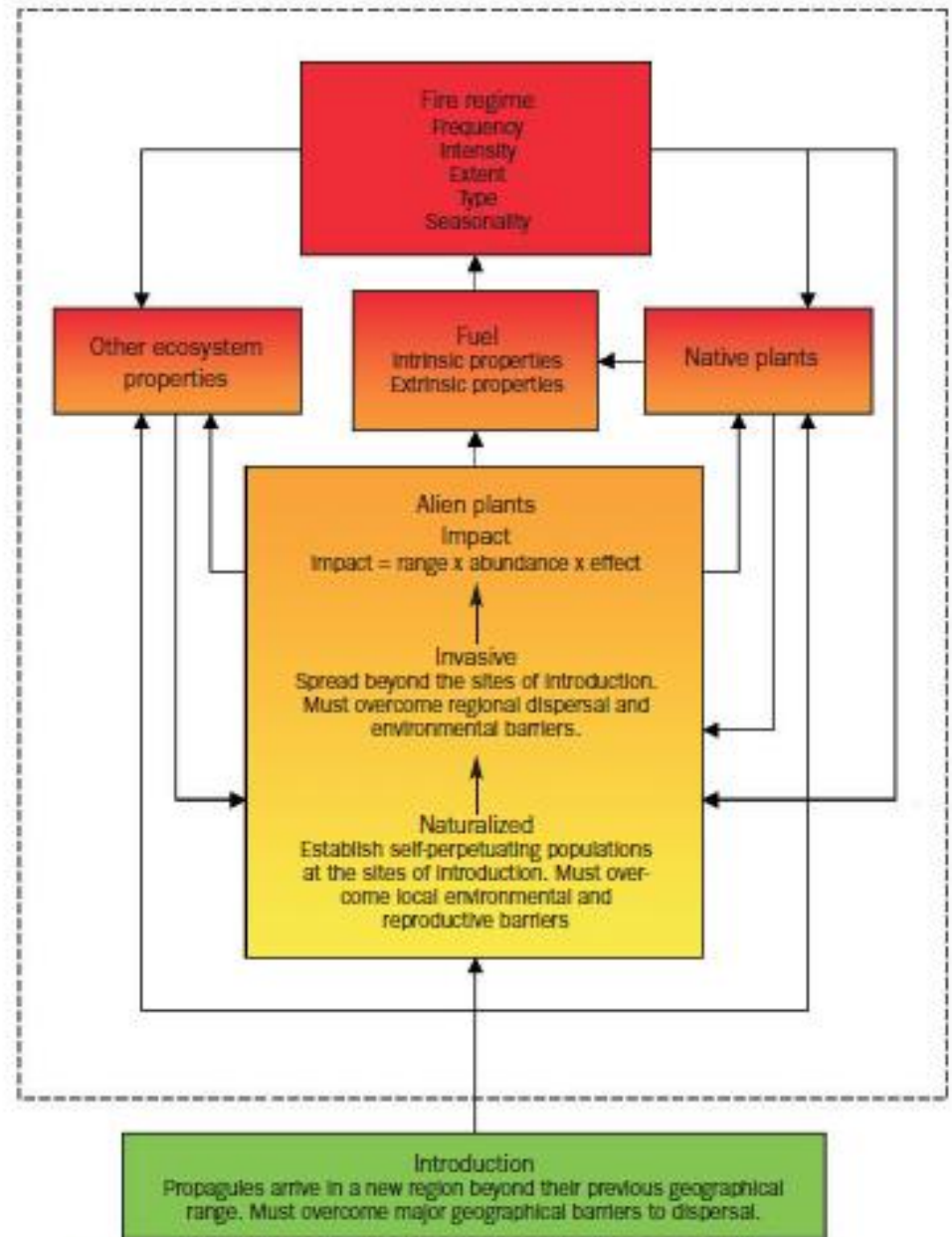
- The problem
- The project
- The species involved (*Hakea sericea* and *Acacia dealbata*)
- Collaborations are welcome

# The problem

- Portugal is an invasion-prone country, given its mild climate and the introduction of many alien plant species
- Some of those species are fire-adapted
- The use of fire as a fuel management tool may aggravate the problem of plant invasions



## The development of a fire cycle



Brooks *et al.* 2004

Figure 2. The invasive plant–fire regime cycle. Green, phase 1; yellow, phase 2; orange, phase 3; red, phase 4.

# Possible ways of mitigating this problem

- An informed use of fire, may:
  - At least, minimize the risk of expanding the invasive plants, using an appropriate prescription;
  - Eventually, it may contribute to locally eliminate the invasive plant species.

# However

- Currently we don't know how to set a prescription envisaging the achievement of such goals;
- The existing guides on prescribed burning for portuguese conditions:
  - Have the sole goal of managing fuels for fire hazard mitigation
  - Did not consider the risk of plant invasions

# GUIA DE CAMPO PARA FOGO CONTROLADO EM MATOS



# GUIA DE FOGO CONTROLADO EM EUCALIPTAL



giff  
Gestão Integrada  
de Incêndios Florestais

utad  
UNIVERSIDADE  
TÉCNICA  
DE  
COIMBRA

  
**FIRE**globulus

**Piro  
Pinus**

## PRESCRIBED BURNING GUIDE FOR MARITIME PINE STANDS

Version 2.3, August 2011

Paulo Fernandes  
Carlos Loureiro  
Hermínio Botelho

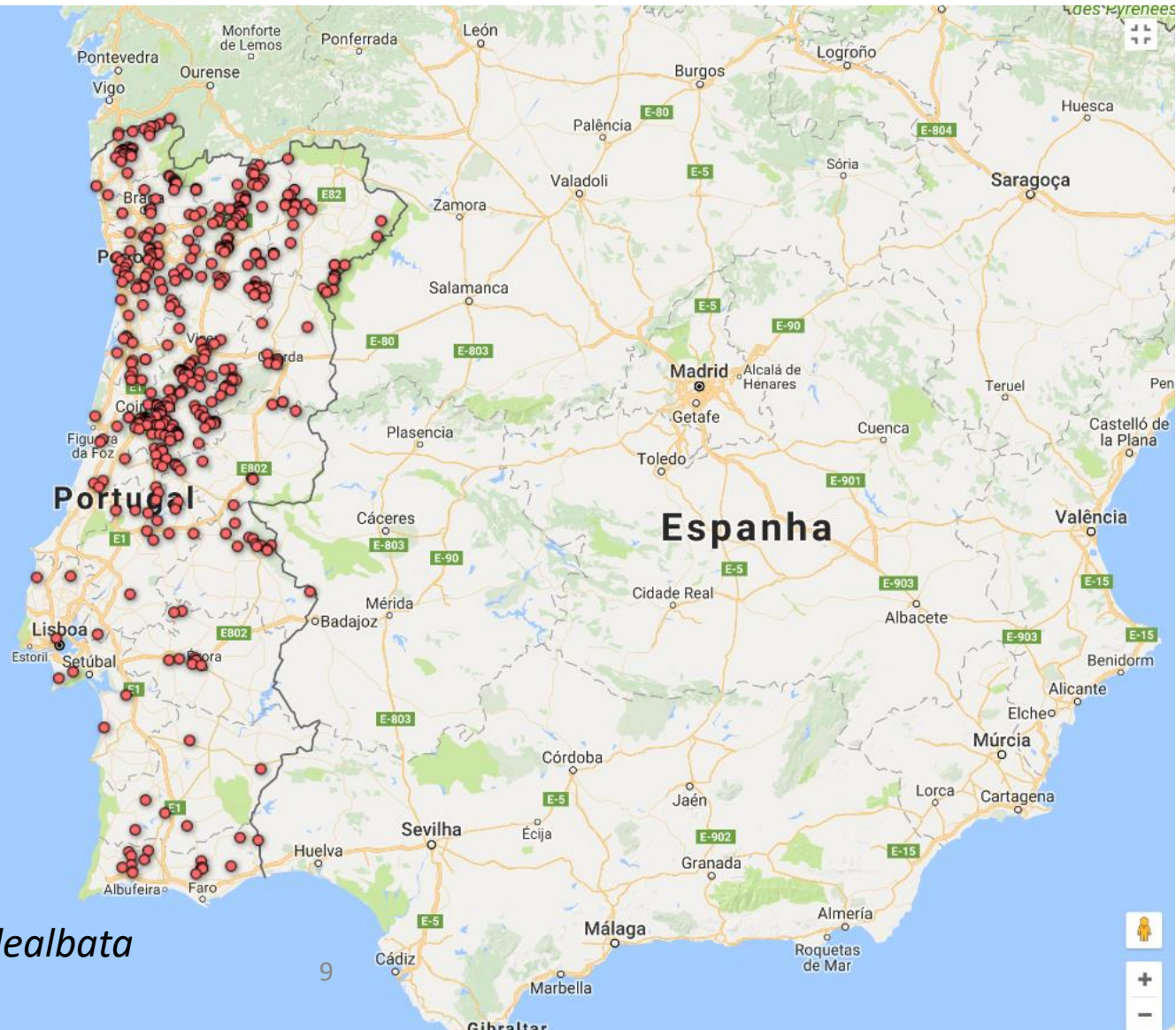
# Two aggressive plant invaders in Portugal

- *Acacia dealbata*
  - Australian origin
  - As many other Fabaceae, it develops a soil seed bank
  - The hard-coated seeds may be stored in the soil for decades
  - Fire triggers seed germination
  - It resprouts vigorously after fire
  - Seed pods can be dispersed at long distances
  - It has been expanding rapidly across the country





Mapa Satélite



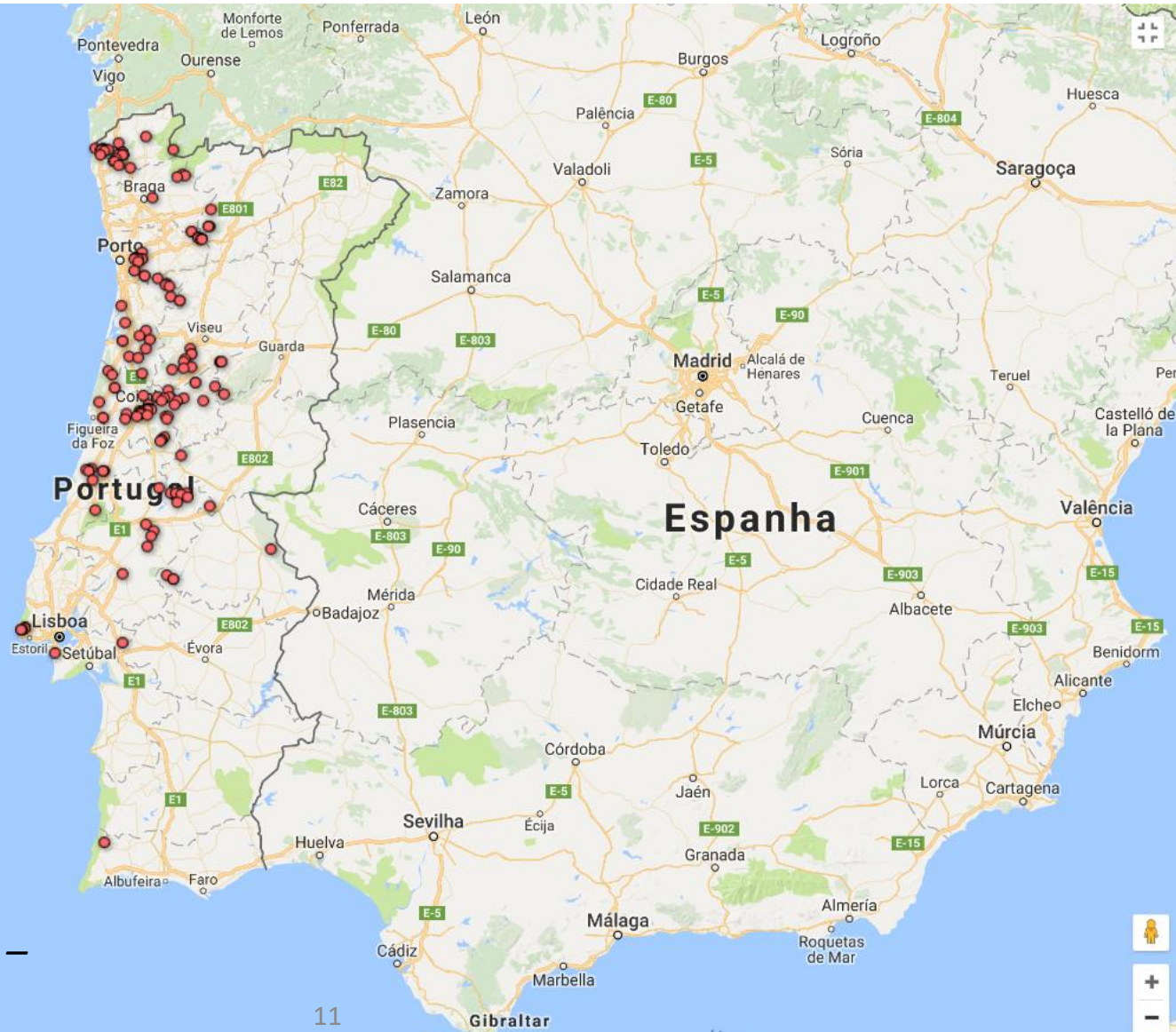
Silver wattle – *Acacia dealbata*

# Two aggressive plant invaders in Portugal

- *Hakea sericea*
  - Another Australian species
  - It is an obligate seeder
  - It develops a canopy seed bank
  - Woody fruits open after fire and disperse the seeds at considerable distances (>100 m), therefore expanding the invaded area



Mapa Satélite



Silky hakea or needlebrush –  
*Hakea sericea*



Instituto Politécnico de Coimbra  
Escola Superior Agrária



[https://c1.staticflickr.com/7/6005/5983324621\\_34ca143f99\\_b.jpg](https://c1.staticflickr.com/7/6005/5983324621_34ca143f99_b.jpg)

Foto: Juli Pausas



Fogo Controlado da Associação Florestal do Baixo Vouga 2014





# Aims of the Aliens & Flames project

1. To produce information for an informed use of fire, in areas invaded by the two target species;
2. To develop prescribed burning techniques as an alternative approach to control the two target species;
3. To control for colateral effects of fire on the native seed bank and on soil erosion;

# Aims of the Aliens & Flames project

4. To develop models allowing to forecast the risk of invasion according to different fire regime scenarios;
5. To develop fuel models for areas dominated by the two target species, allowing for better fire behavior simulation in these areas;
6. To assess the effect caused by the invasion of these two species on fire hazard;



# Aims of the Aliens & Flames project

7. To develop a methodological framework to study fire-plant relationships for other invasive species;
8. To disseminate the results among stakeholders (managers and forest owners).

# The team

## IPC-ESAC

Joaquim Sande Silva

José Gaspar

Hélia Marchante

António Dinis Ferreira

Rosinda Leonor Pato

David Davim

Mauro Nereu

## VUMBA

Ruben Gama

## Sfera Ultimate

João Pedro M. C. Costa

Igor Emanuel C. Barbosa

Francisco Manuel M. Seabra

## AFP

Rita Isabel S. Rodrigues

Tânia Sofia F. F. Antunes

## AFBV

Luís Sarabando da Rocha

Luís André A. de Almeida

## Silvokoala

Katherine Serra

Susana Ferreira

Nuno Valente

Rui Pedro

## GreenClon

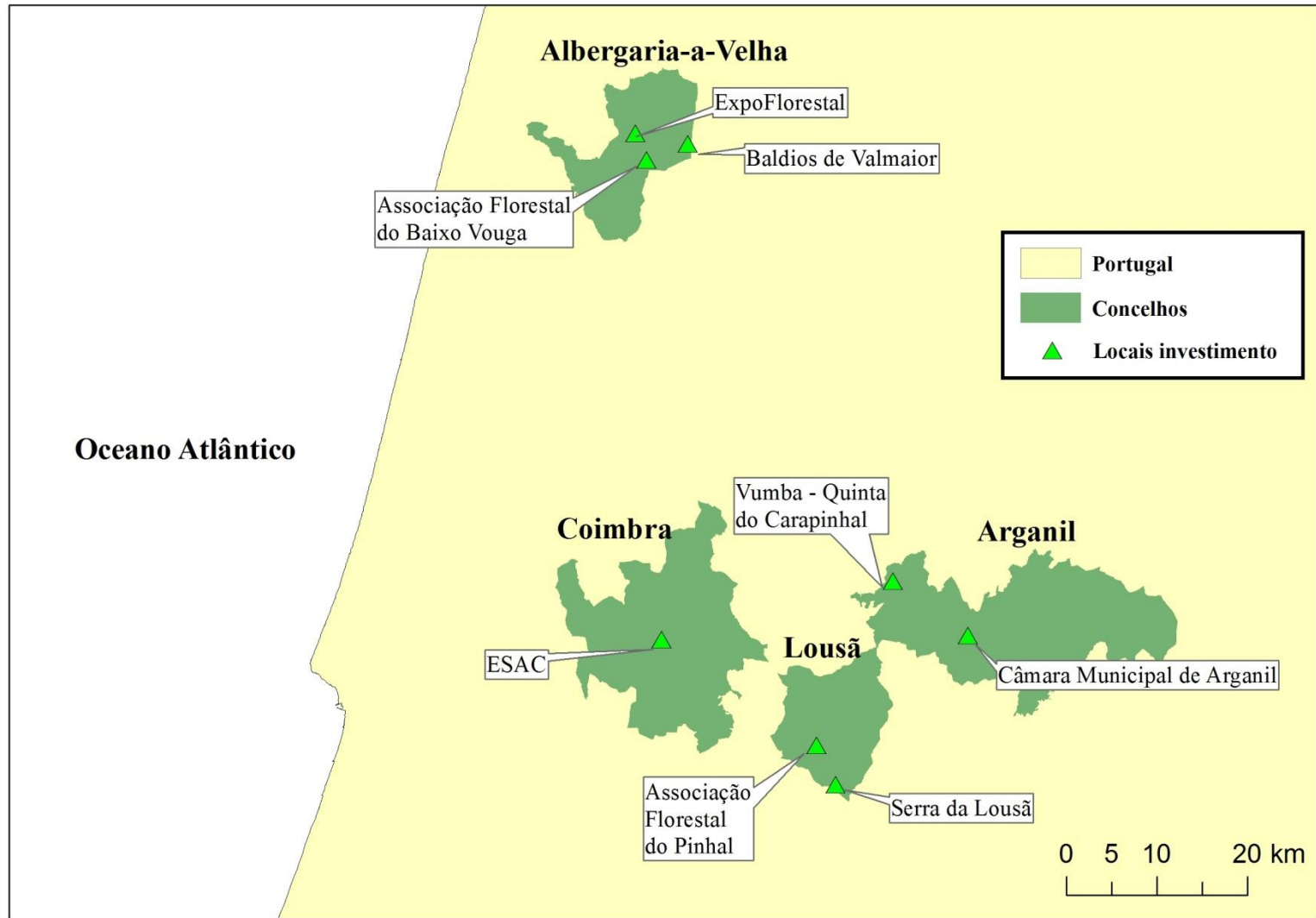
Luís Pessoa

# Other collaborators

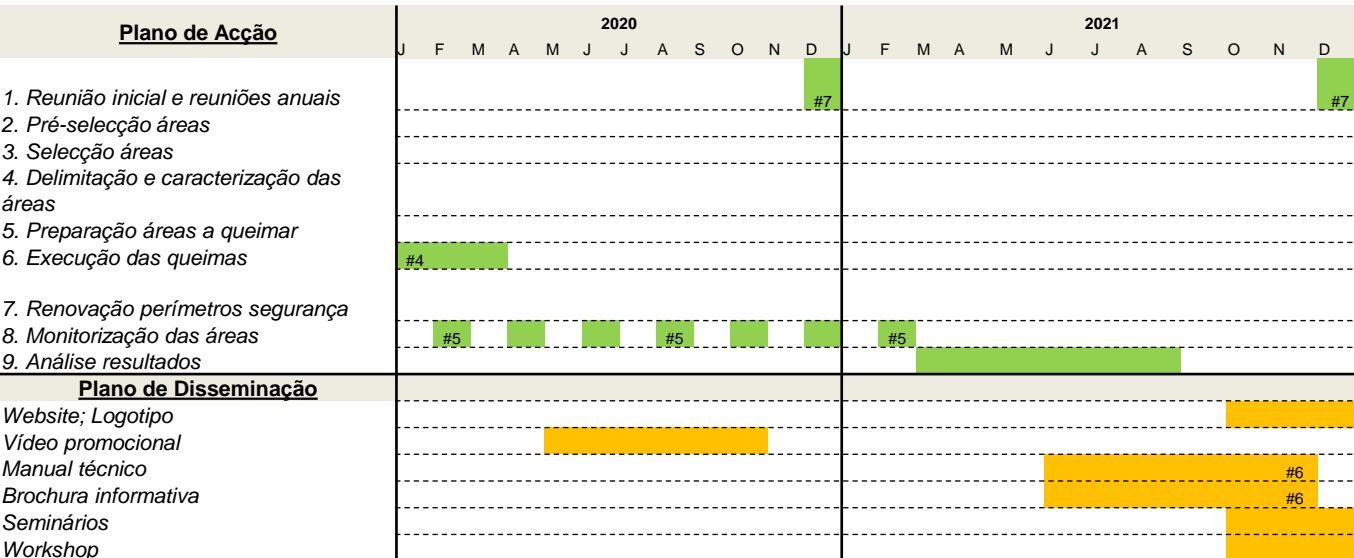
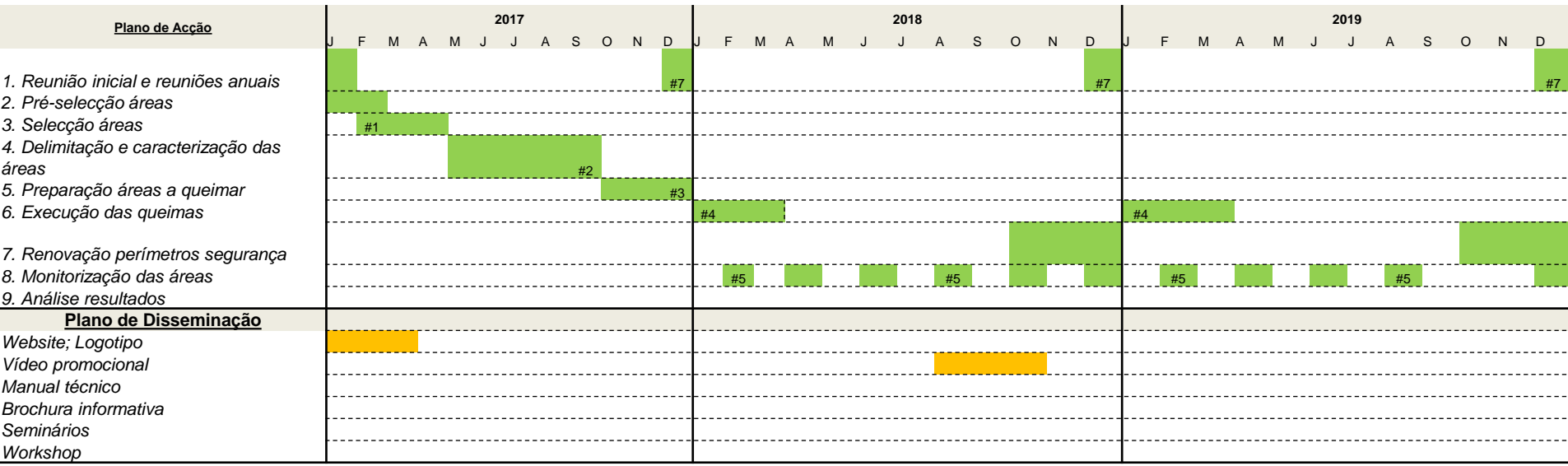
- Ernesto de Deus (ISA – UL)
- Carlos Rossa (UTAD)
- Oscar Pelayo and Jacob Keizer (Univ. Aveiro)
- Sérgio Correia (ESAC - IPC)

THIS IS AN OPEN LIST !!

# Target areas to install



# Original timeline (now outdated)



## Plano de Acompanhamento e Avaliação

- #1 Avaliação áreas pré-seleccionadas
- #2 Avaliação delimitação/caracterização das áreas
- #3 Avaliação preparação áreas
- #4 Avaliação áreas queimadas
- #5 Avaliação semestral dados recolhidos
- #6 Avaliação/validação dos produtos finais
- #7 Avaliações anuais

# Experimental design – initial version

1 block = **8 plots** (10 x 5 m + fire break)

**8 combinations**  
slash x burn



No burn

1 burn

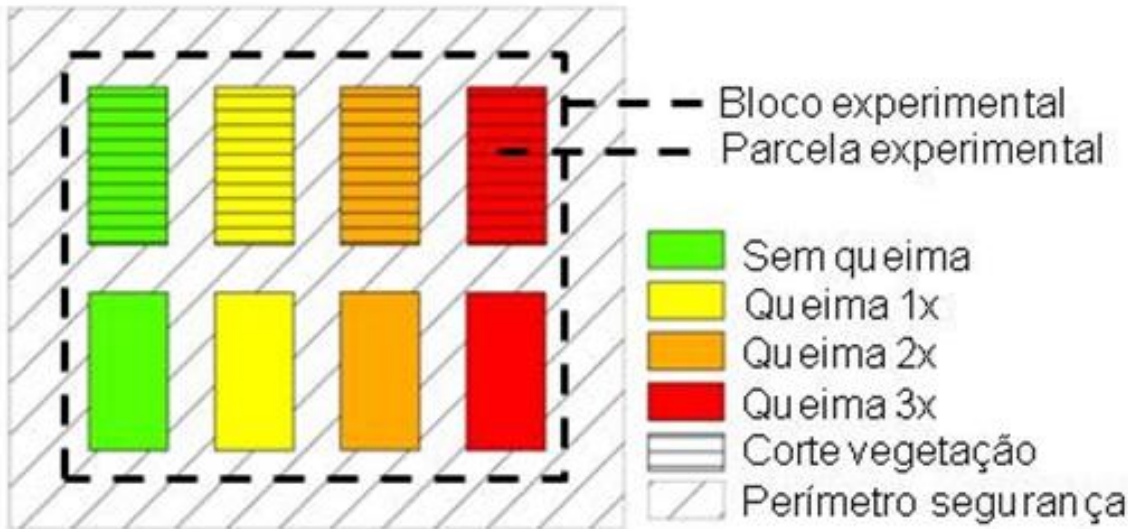
2 burns

3 burns



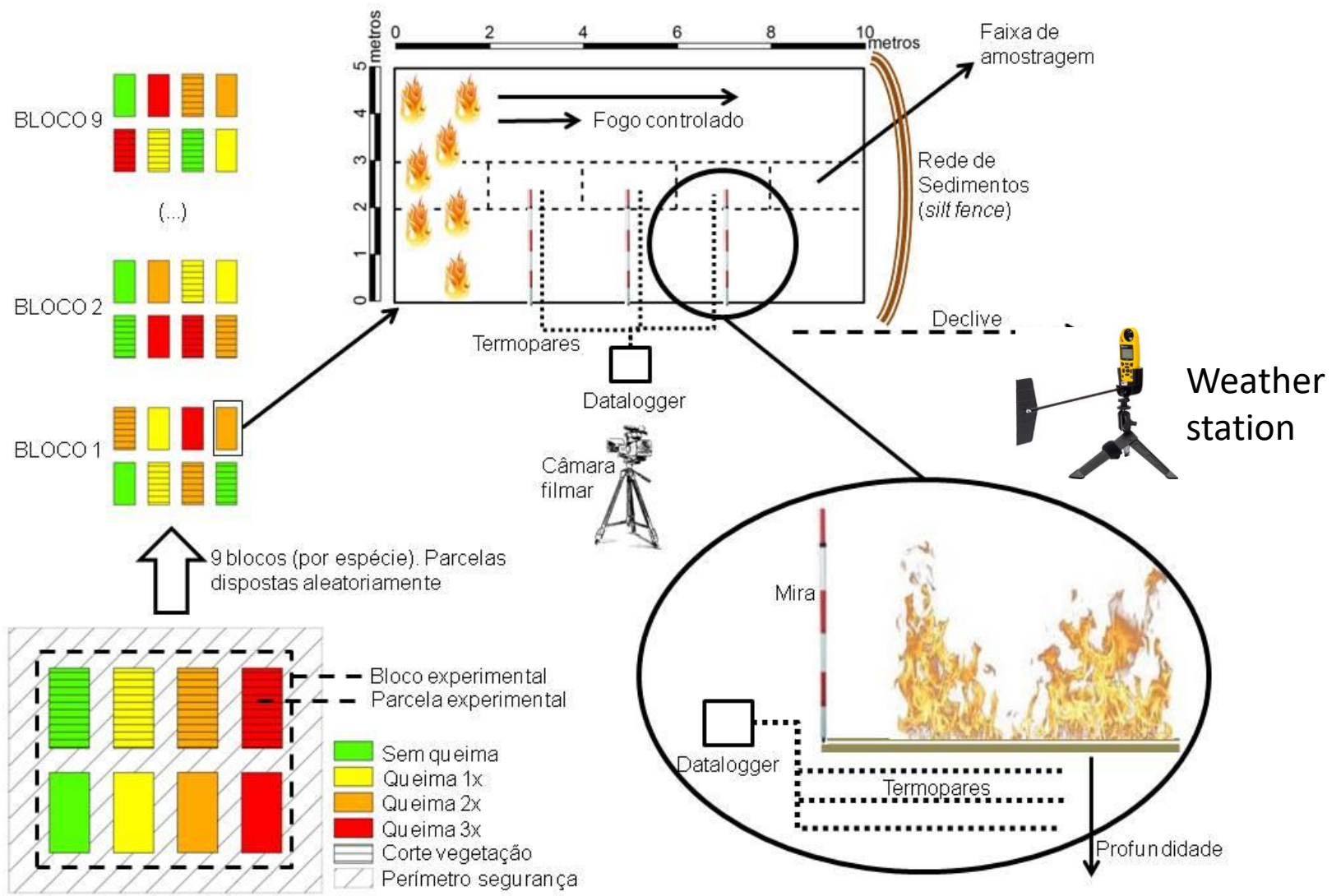
Slash

No slash



2 spp  
x  
8 plots  
x  
9 replications  
=  
**144 plots**

# Experimental design – initial version



# EROSION PLOTS & SOIL SAMPLING



**ESPTeam- Univ Aveiro**



# Selection of study areas

- Areas  $> 1000 \text{ m}^2$
- As close as possible from Coimbra ( $< 70 \text{ km}$ )
- Dominated by one of the two species
- Uniform stands (plants of similar age)

# Initial pre-fire characterization

- Characterization of the fuel complex
- Floristic composition
- Population structure, plant size, etc.
- Soil
- Seed bank
- Some plants will be tagged for monitorization across the project duration

# Slash and burn treatments

- To start next autumn
- Meteo conditions may/will be a strong constraint
- Slash treatments will provide fuel continuity
- Different ignition techniques to be tested
  - Different fireline intensities
  - Different residence times
  - Different soil temperatures

# Plot monitoring

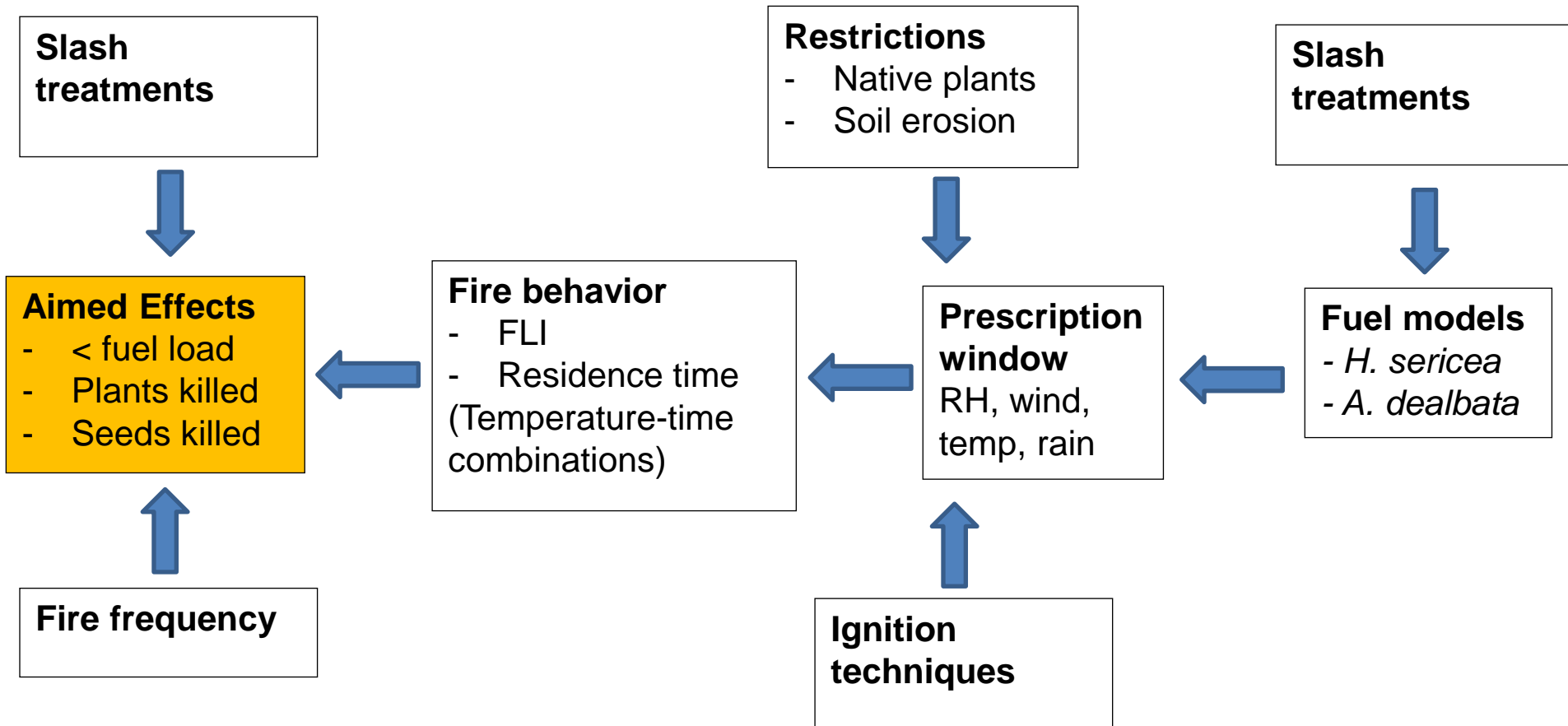
Five main sets of data to collect along the projet timeline

1. Seed dispersal
2. Soil seed bank
3. Fuel characteristics
4. Plant demography and development
5. Soil erosion

# Project Outputs

- A guide of best practices for the use of prescribed burning in areas invaded by *H. sericea* and *A. dealbata*
- A brochure addressed to forest owners
- Scientific papers to be published in international journals

# Prescription framework



# Collaborations are welcome !

- We seek new areas to install the plots, under certain restrictions;
- We also seek researchers that are interested to use our network of experimental plots to expand the studies on fire effects.
- Please contact [jss@esac.pt](mailto:jss@esac.pt)

**THANK YOU !**