



XX Encontro Nacional de Ecologia

Assessing the potential of different grazing regimes for biodiversity conservation and wildfire prevention in Mediterranean ecosystems

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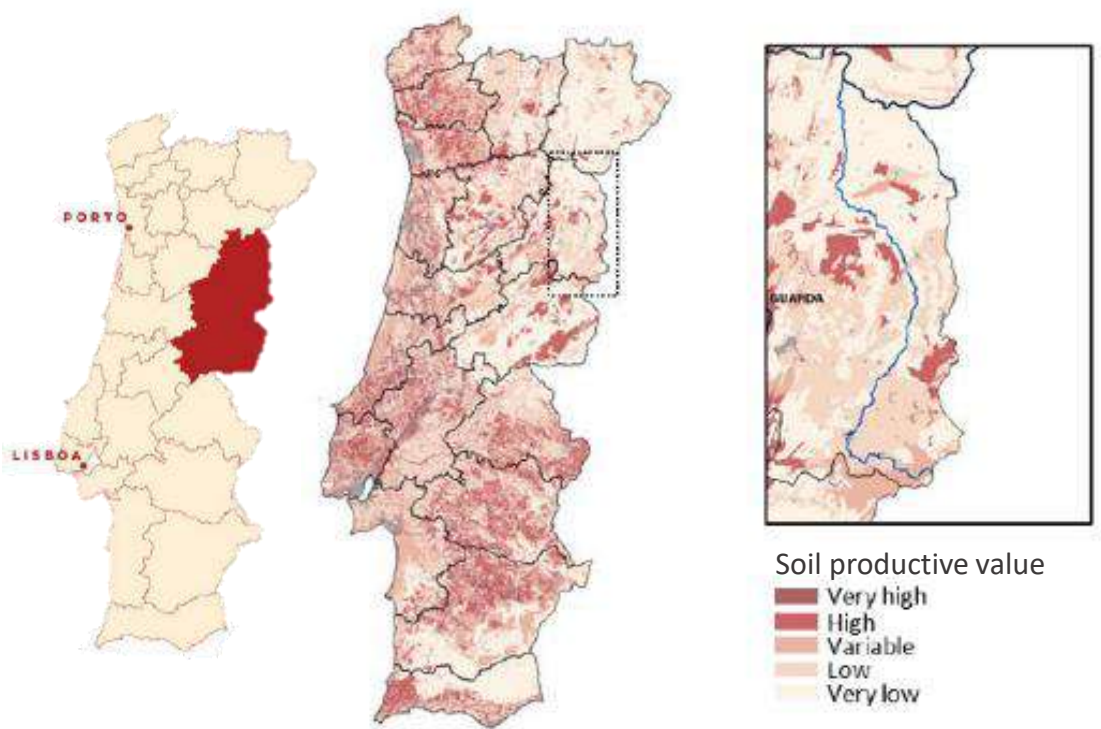
LAND ABANDONMENT AND WILDFIRE RISK

Marginal farmland areas → Cessation of farming activities led to afforestation or to land abandonment



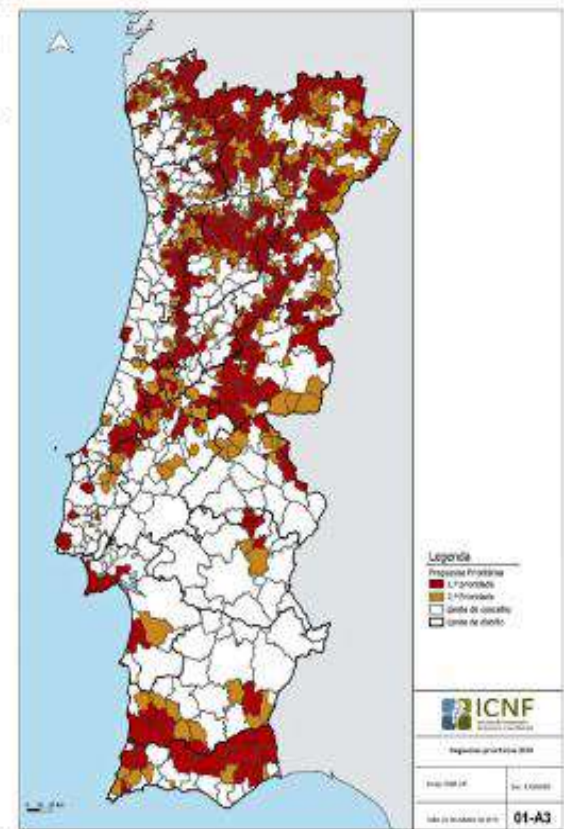
Accumulation of fuel loads

+ risk of wildfires






From: <http://epic-webgis-portugal.isa.ulisboa.pt/>

District	Fire-prone tree species (%)	Shrubland (%)
Viana do Castelo	23	33
Braga	28	19
Porto	29	13
Vila Real	18	31
Bragança	6	33
Aveiro	45	10
Viseu	30	27
Guarda	13	39
Coimbra	43	19
Castelo Branco	34	26
Leiria	40	16
Lisboa	13	17
Setúbal	15	13
Santarém	26	15
Portalegre	10	20
Évora	4	17
Beja	4	23
Faro	7	36



STUDY AIM

Assess the effects of different grazing systems on:

- Wildfire prevention 
- Plant diversity 
- Tree recruitment 



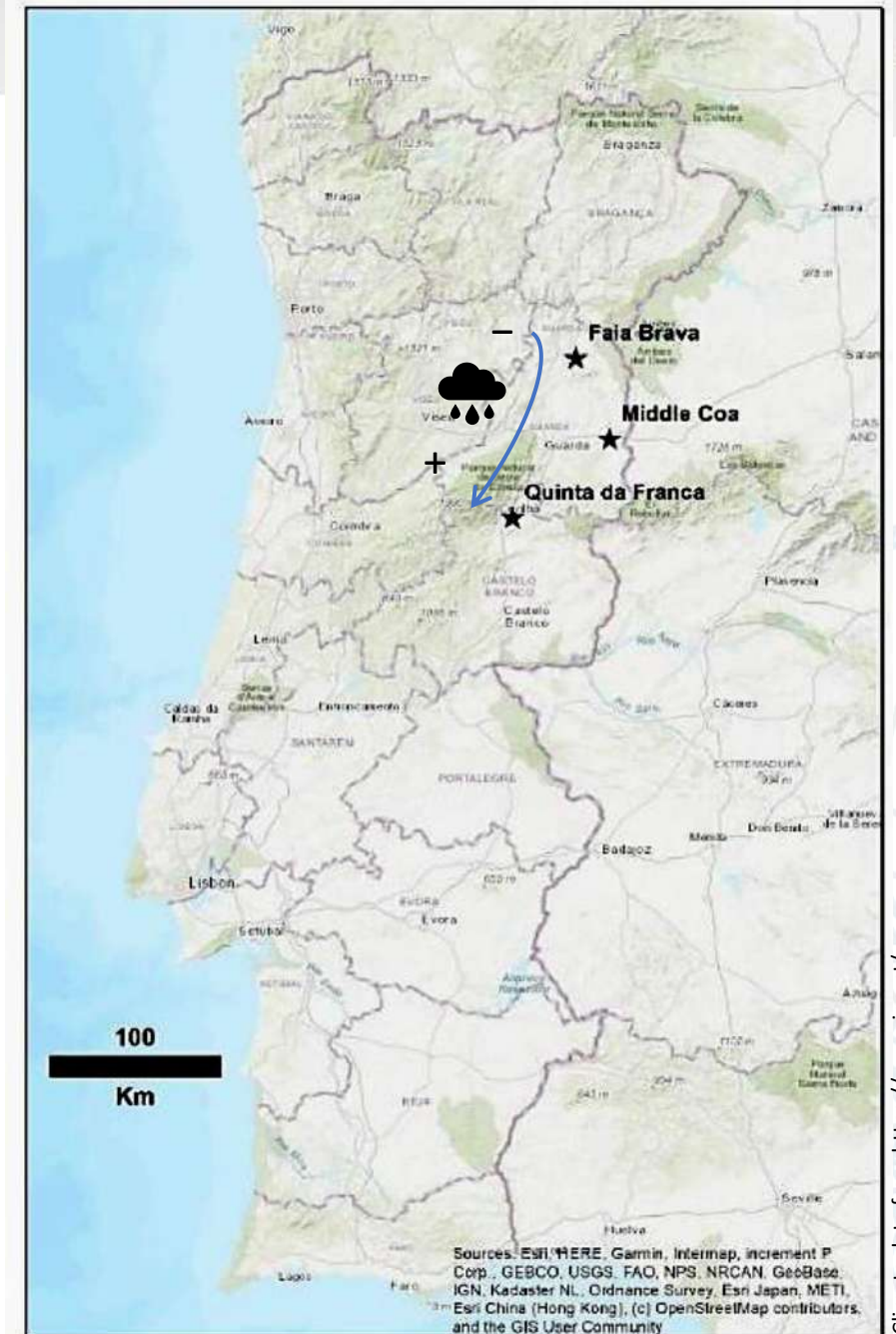
STUDY AREAS

- Reserva da Faia Brava
- Freineda/Middle Côa
- Quinta da França

Low soil fertility, abundant rock outcrops and steep slopes, limit economic viability and pose challenges to sustainable land use.

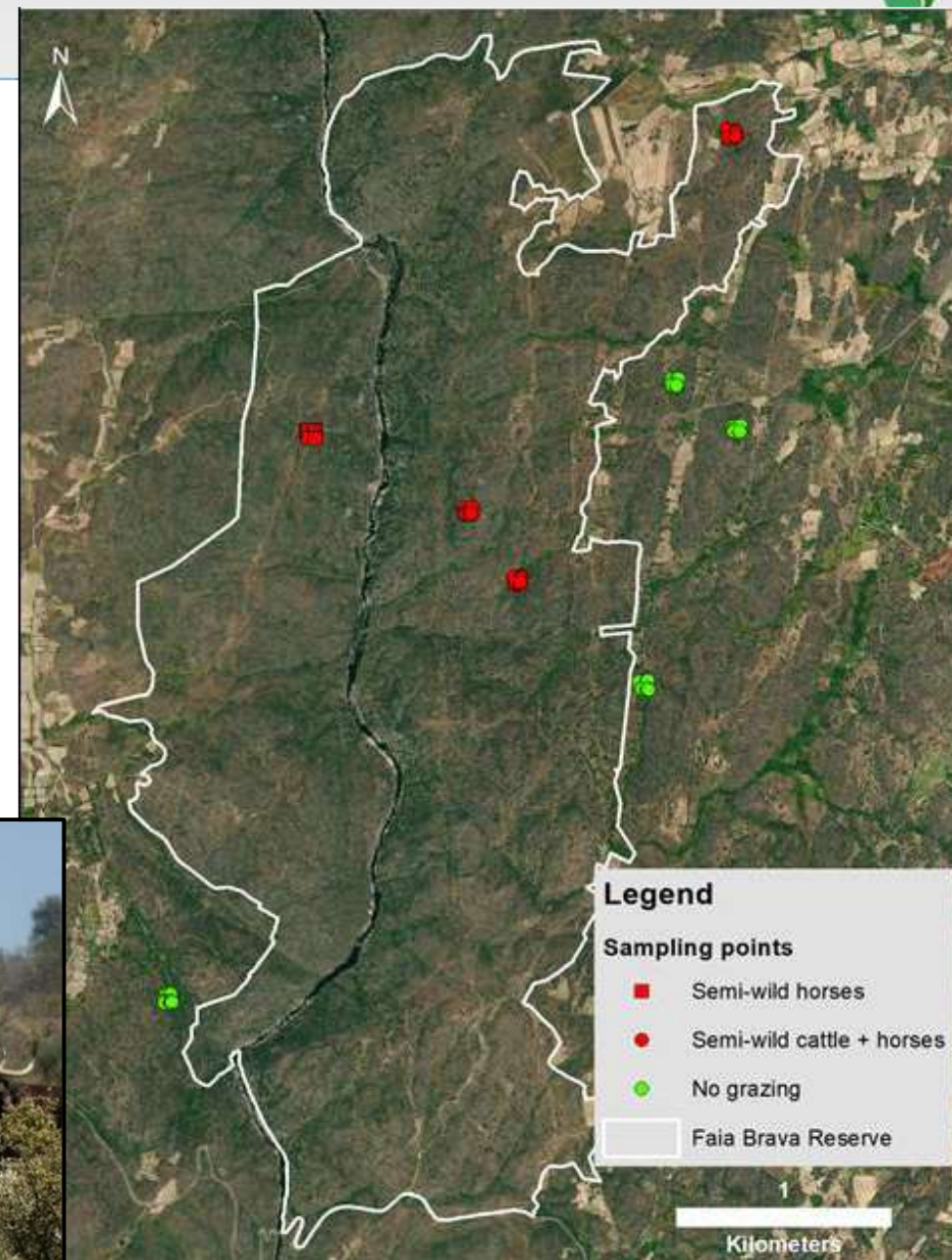
Environmental gradient:

- Reserva da Faia Brava is the driest area with dominance of holm oak - *Quercus rotundifolia*
- Freineda/Middle Côa has intermediate climate with co-dominance of holm oak – *Q. rotundifolia* and pyrenean oak - *Q. pyrenaica*
- Quinta da França has a wetter climate with dominance of pyrenean oak - *Q. pyrenaica*)



STUDY AREAS

- **Reserva da Faia Brava**
 - Freineda/Middle Côa
 - Quinta da França
-
- Abandoned/No grazing (**NG**)
 - Semi-wild grazing (**SWG**) (0.1 LU/ha, all year-round grazing)
-
- Presence of wild boar and roe deer (very rare)

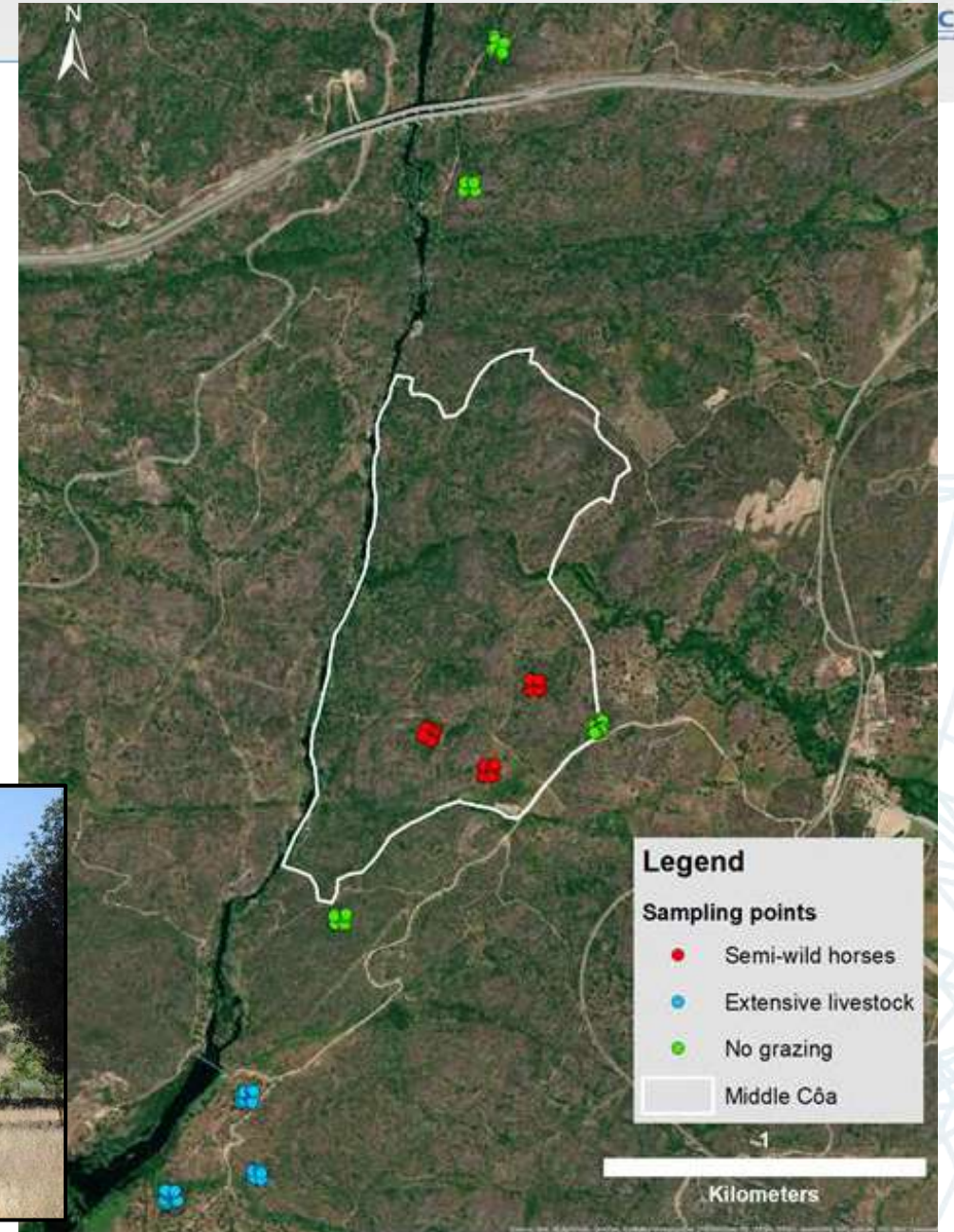


STUDY AREAS

- Reserva da Faia Brava
- **Freineda/Middle Côa**
- Quinta da França

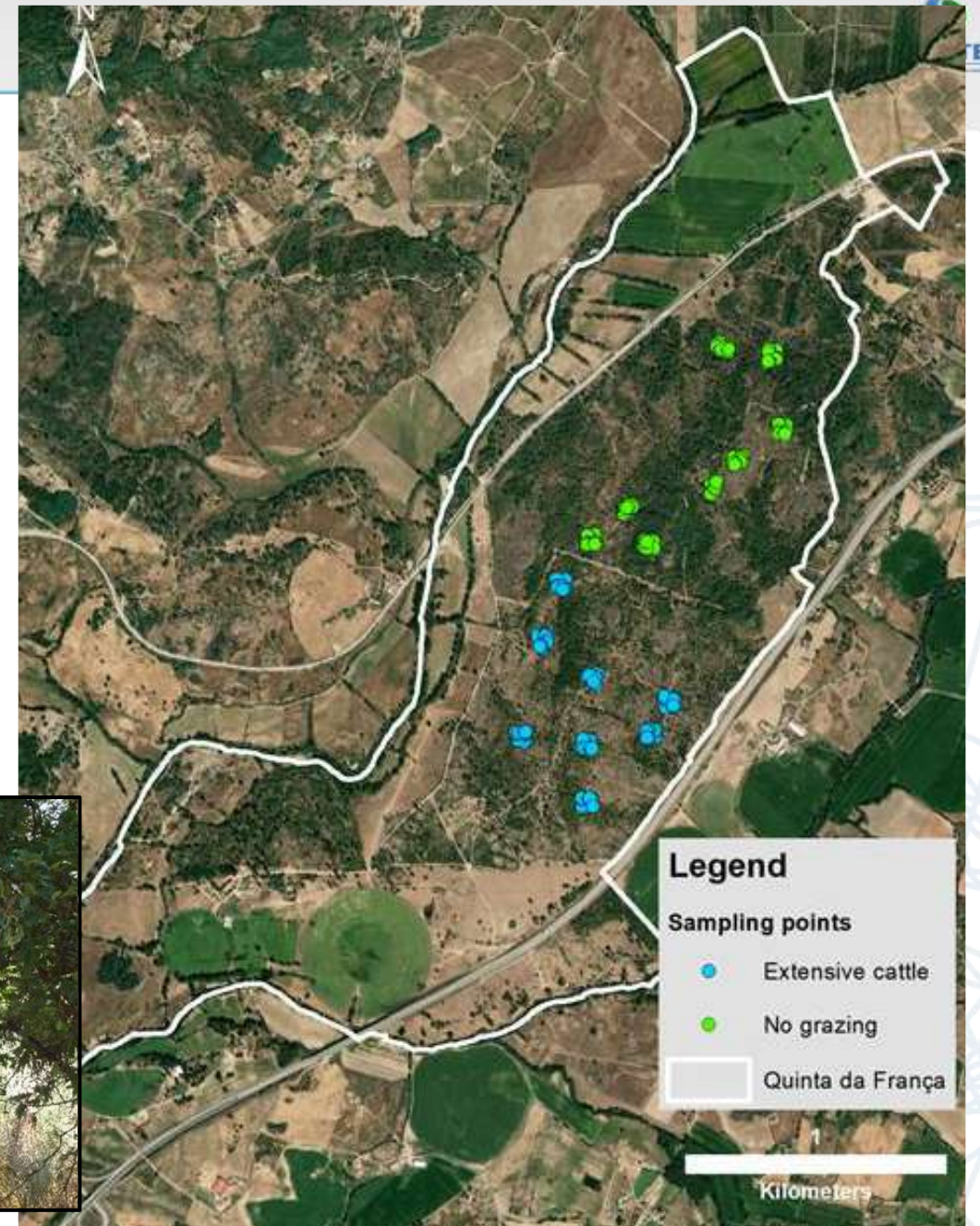
- Abandoned/No grazing (**NG**)
- Semi-wild horses (**SWG**) - Garrano horses since 2014 (< 0.1 horses/ha, all year-round grazing)
- Extensive livestock (**EL**) – Cattle in natural pastures (0.4-0.6 cows/ha)

- Presence of wild boar and roe deer (rare)



STUDY AREAS

- Reserva da Faia Brava
 - Freineda/Middle Côa
 - **Quinta da França**
-
- No grazing (**NG**)
 - Extensive livestock (**EL**) - Cattle in a regenerating oak forest (0.2 cows/ha)
-
- Presence of wild boar and roe deer



FIELD DATA AND INDICATORS

Field surveys

- **Vegetation structure:** vegetation cover type and height (or presence of bare soil)
- **Vascular plant composition:** presence and percentage cover of understory plant species (Braun Blanquet's cover scale)
- **Oak recruitment:** presence of seedlings or saplings (<50 cm)
- **Drone surveys:** produce high resolution land cover maps

Indicators of vegetation structure and fire risk

Field level

- Foliage Height Diversity index (FHD)
- Mean Shrub Height
- % Shrub Cover
- % Tree Cover
- Aboveground shrub biomass (S_b)
- Vertical vegetation profile

Landscape level

- Largest Patch Index
- Mean Patch Size
- Clumpiness Index
- Edge Density

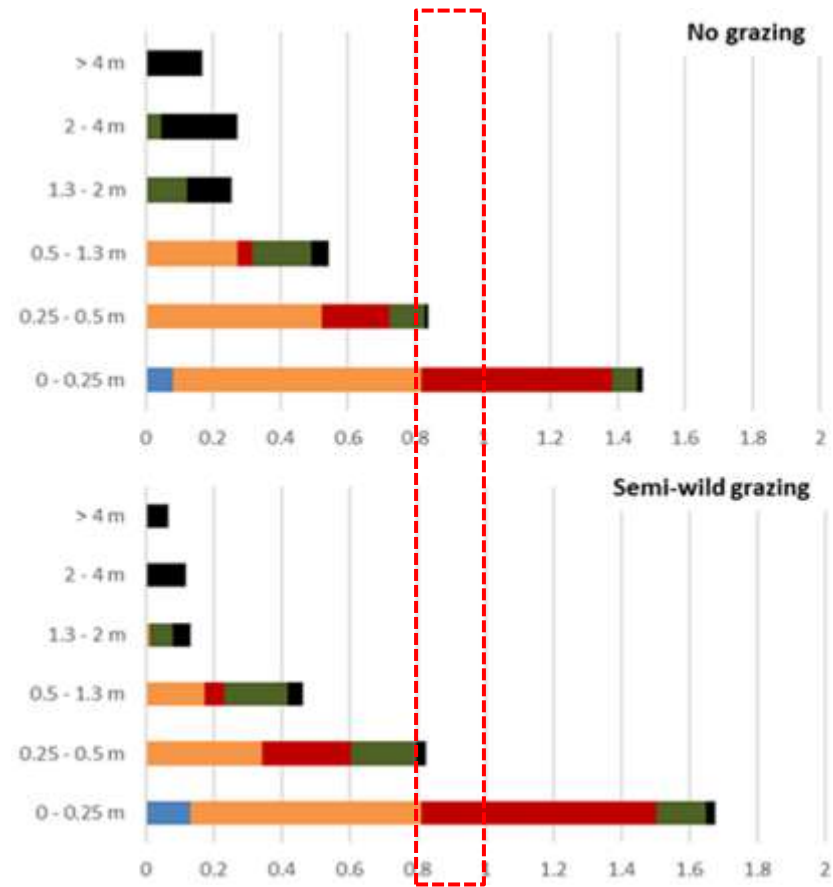
RESULTS - WILDFIRE PREVENTION AND VEGETATION STRUCTURE

Faia Brava

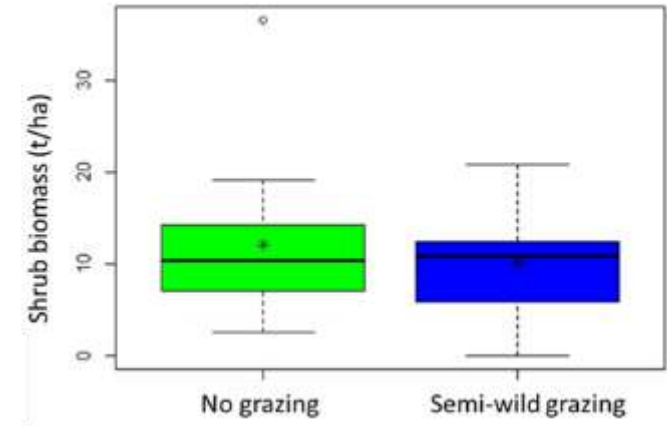
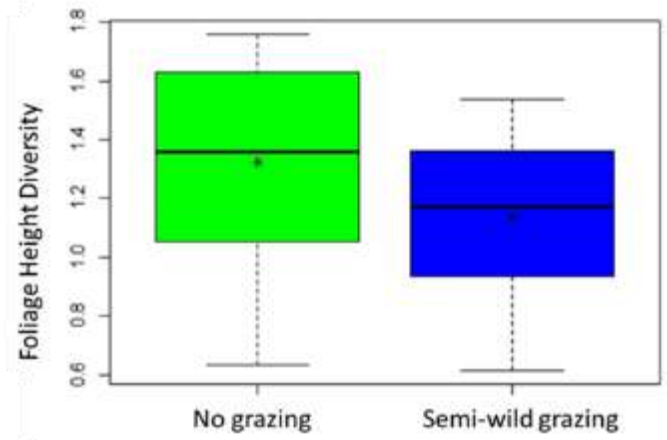
- **No significant differences** for the vegetation structure profiles between abandoned/no grazing and semi-wild grazing sites
- **Higher FHD values** in the ungrazed sites possibly due to the **larger proportion of tree cover**.



- Bare soil
- Grass
- Forb
- Shrub
- Tree



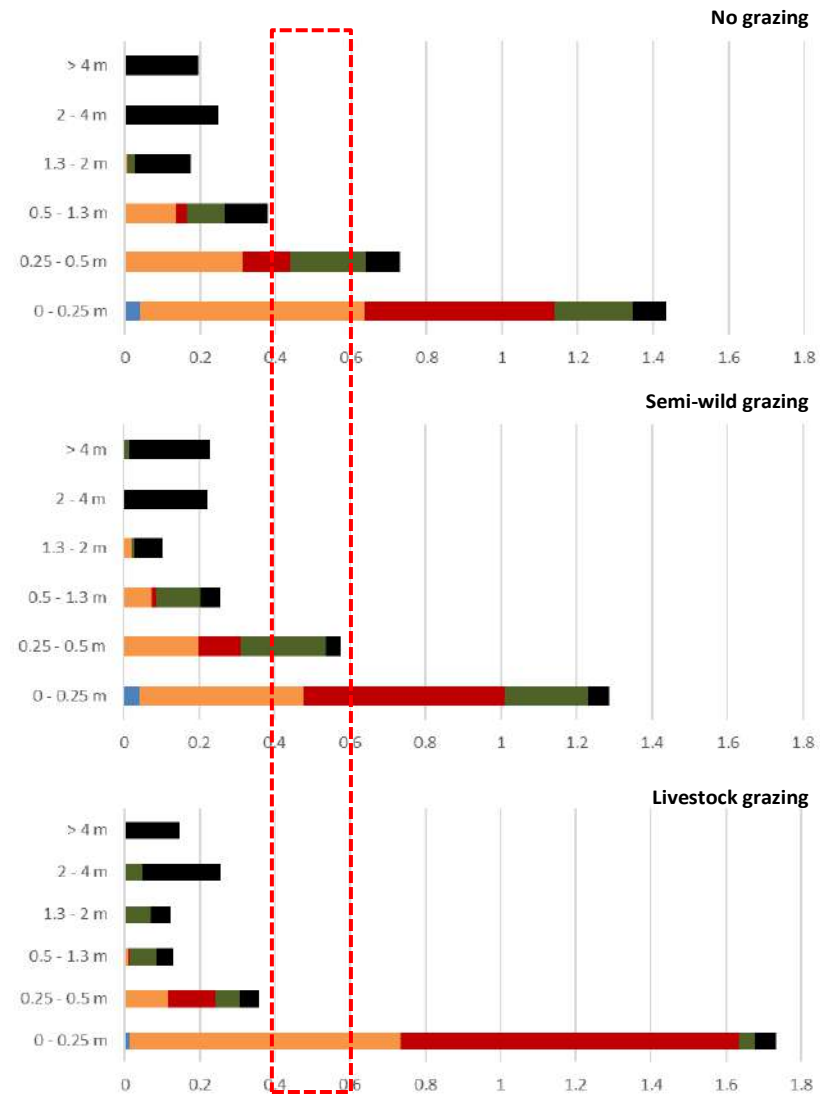
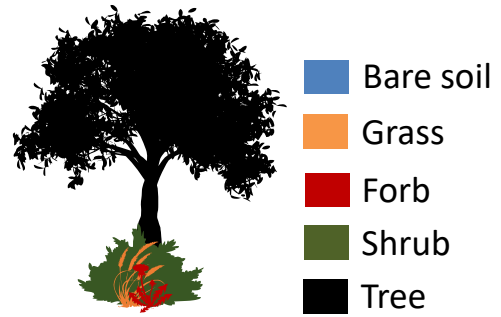
Local level



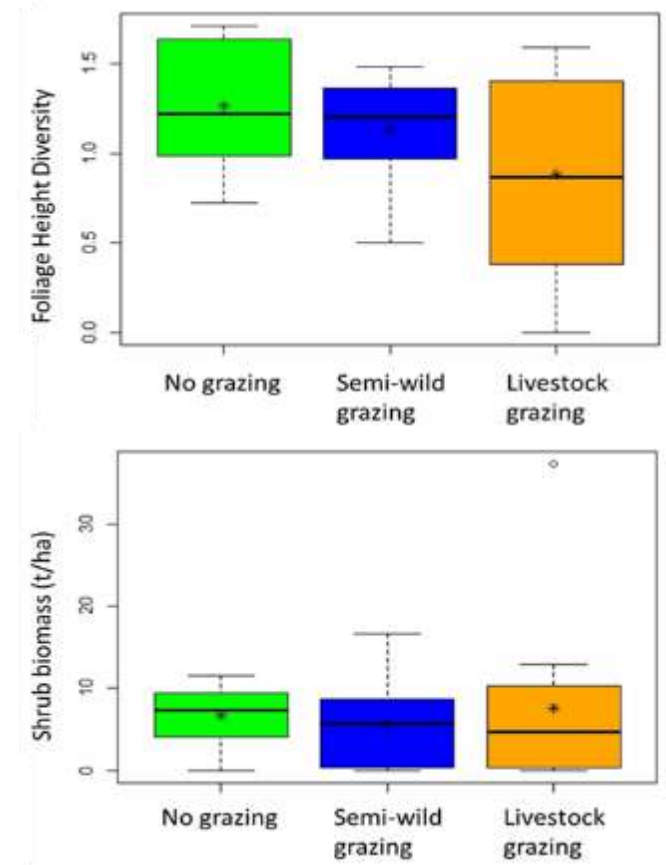
RESULTS - WILDFIRE PREVENTION AND VEGETATION STRUCTURE

Freineda/Middle Côa

- Livestock grazing sites with **larger proportion of grasses and forbs** at the ground level
- No grazing sites with **higher complexity in vegetation structure** (FHD values)



Local level



RESULTS - WILDFIRE PREVENTION AND VEGETATION STRUCTURE

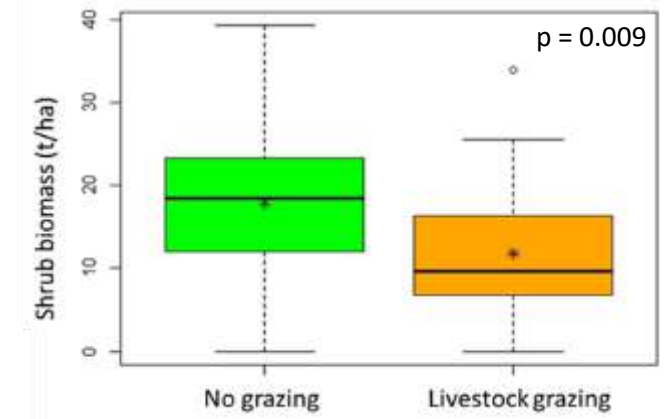
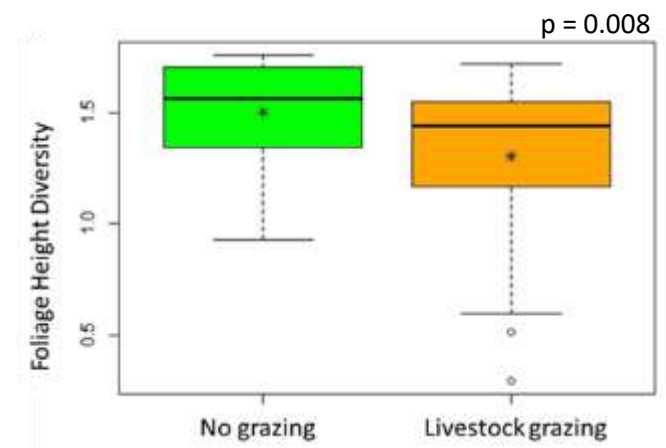
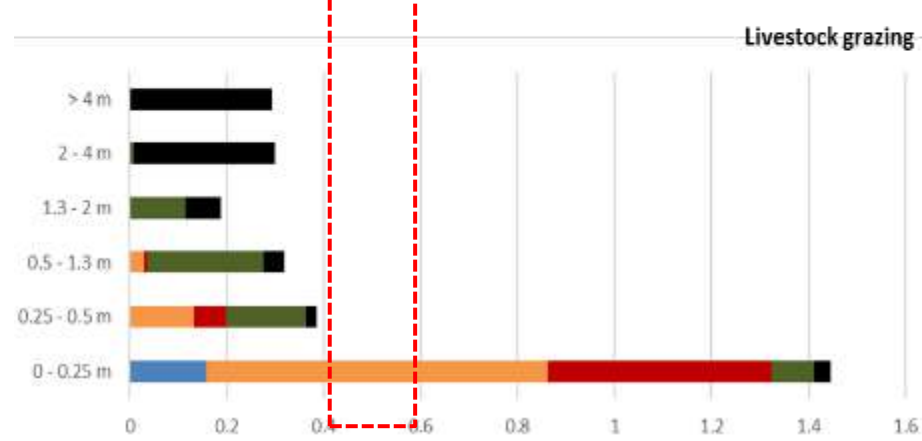
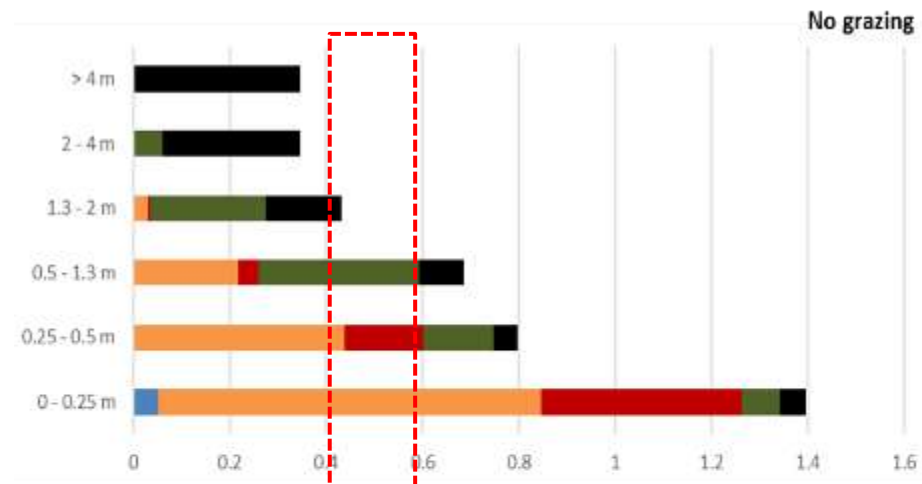
Local level

Quinta da França

- Livestock grazing sites with **lower proportion of tall grasses** in the intermediate layers
- Higher proportion of bare soil
- **Simplified vegetation structure** in grazed areas (FHD)

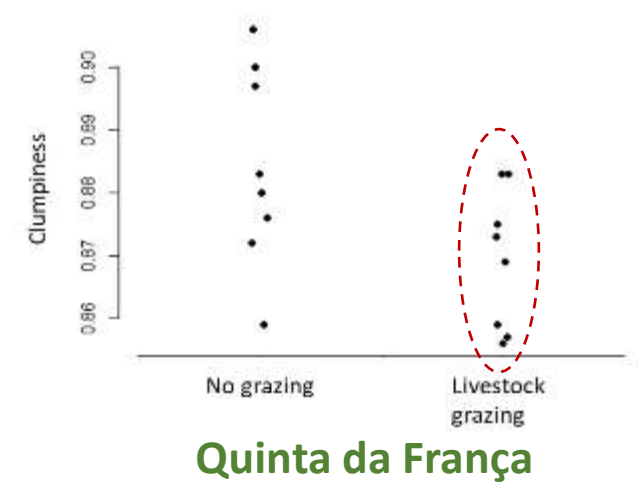
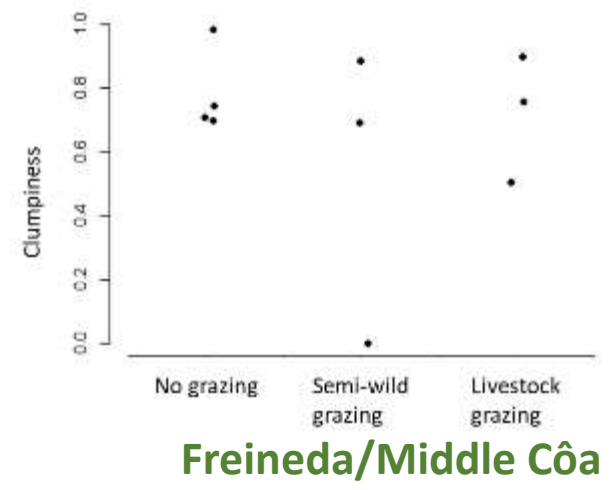
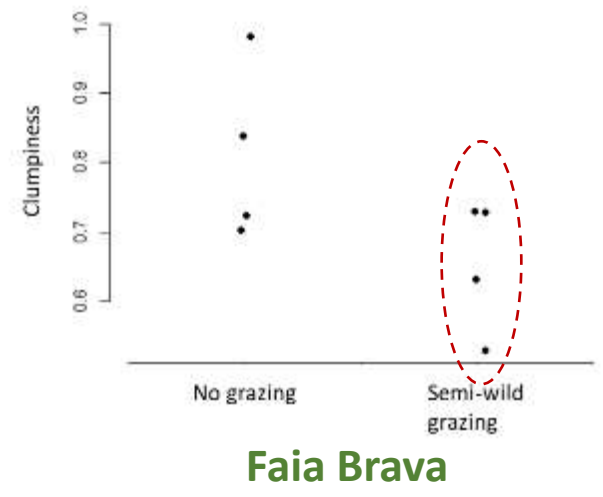


- Bare soil
- Grass
- Forb
- Shrub
- Tree

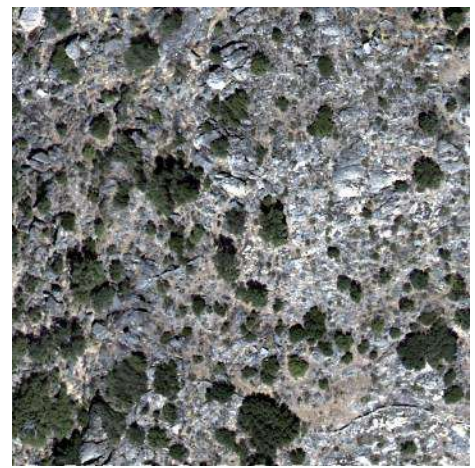
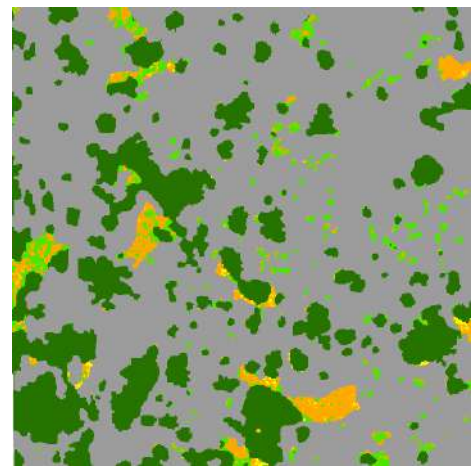


RESULTS - WILDFIRE PREVENTION AND VEGETATION STRUCTURE

Landscape level

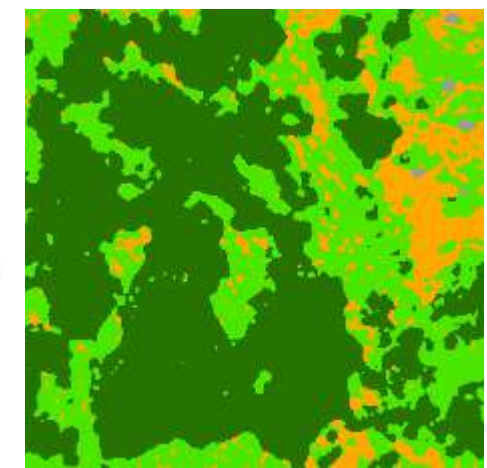


↓ shrub cover clumpiness
↓ fuel connectivity

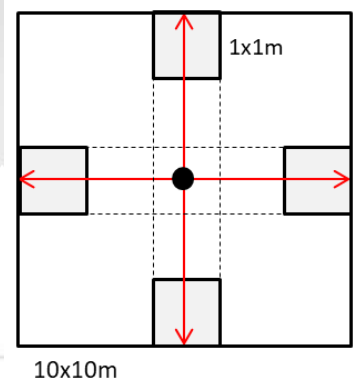


- Rock outcrops
- Trees
- Shrubs
- Grasses
- Bare soil

↓ shrub connectivity

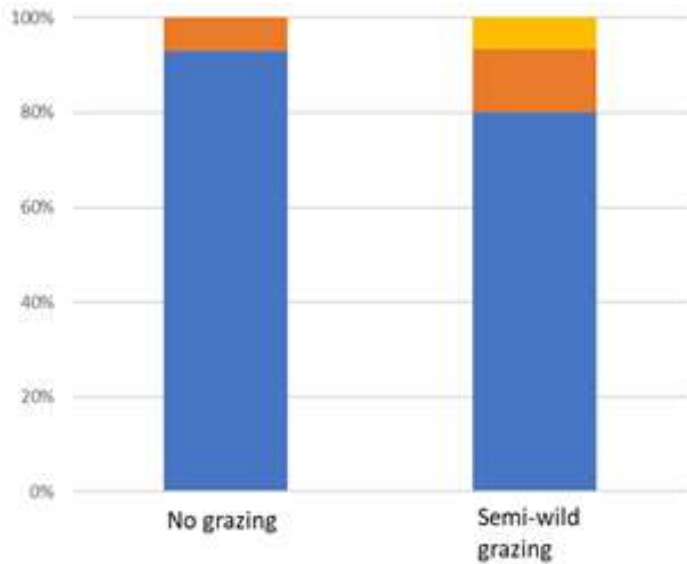


↑ shrub connectivity



RESULTS - TREE RECRUITMENT

Faia Brava

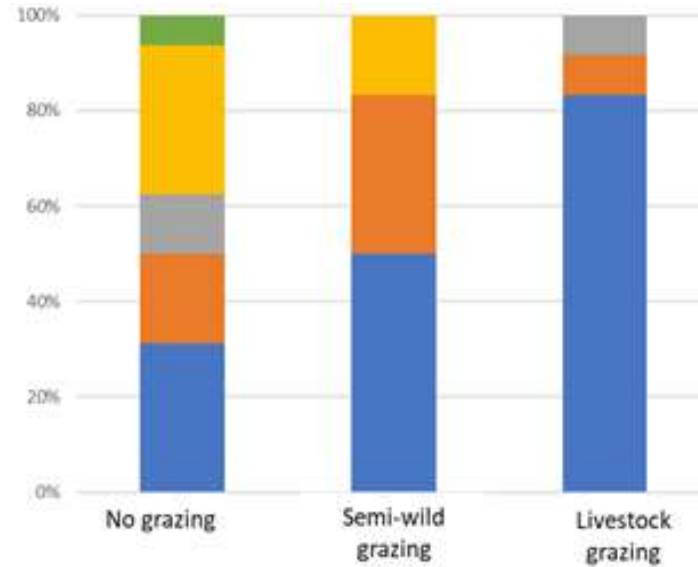


- Recruitment levels very low for both grazing regimes



Poor soil conditions, rocky areas and arid climate

Freineda/Middle Côa

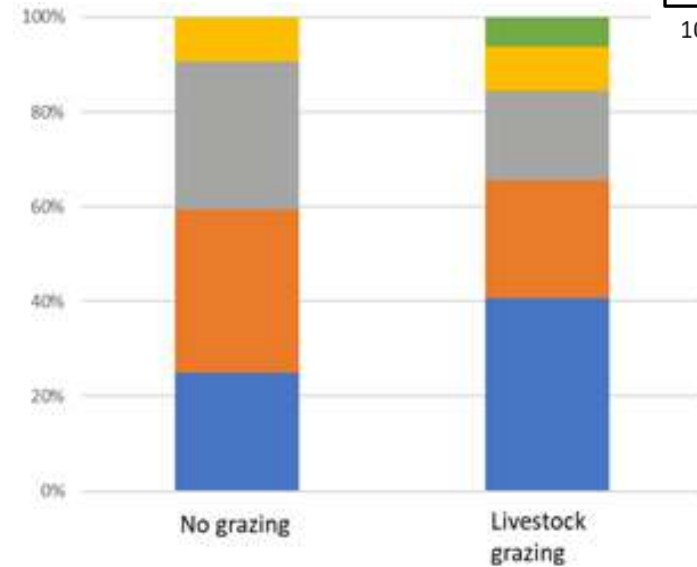


- Low recruitment levels associated with presence of herbivory



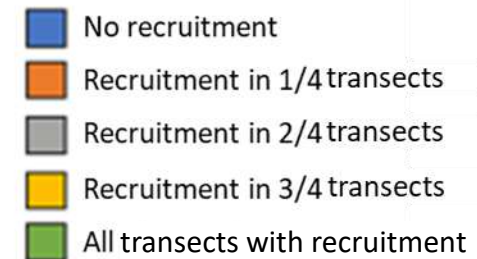
Very low values for livestock grazing ($\approx 20\%$)

Quinta da França



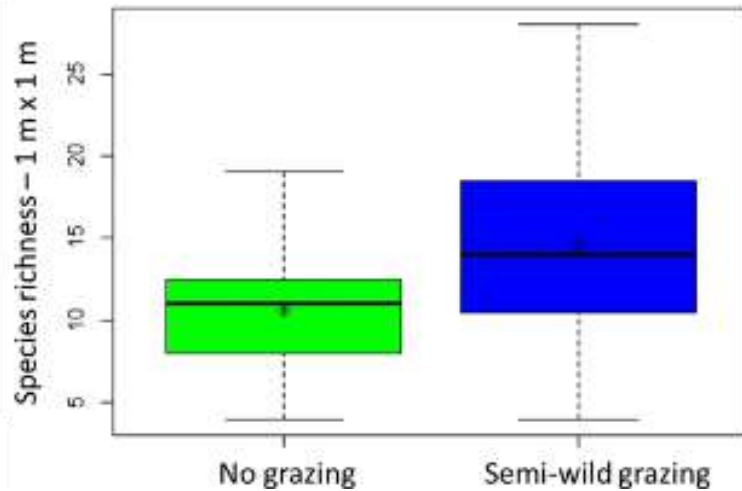
- Lower recruitment in plots under livestock grazing ($\approx 60\%$)

Recruitment proportion



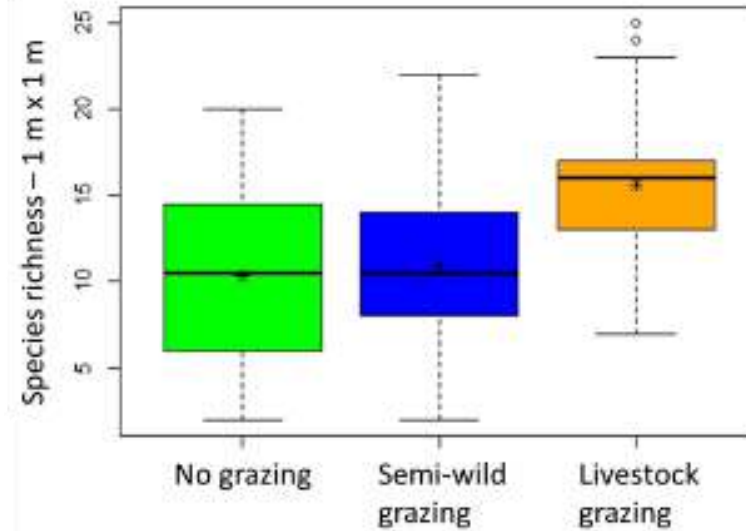
RESULTS - PLANT COMMUNITY COMPOSITION

Faia Brava



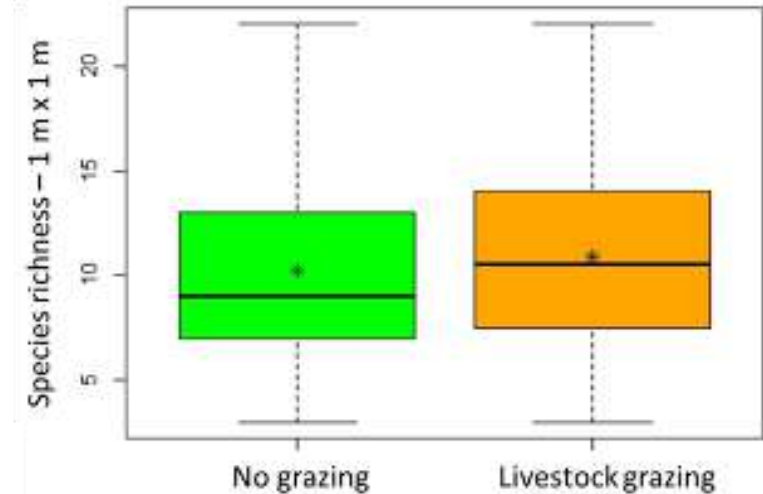
- Higher species richness in **Semi-wild grazing** sites
- Cytisus multiflorus* was dominant in both grazing regimes.
- 84 species in No grazing sites and 118 in Semi-wild grazing sites

Freineda/Middle Côa



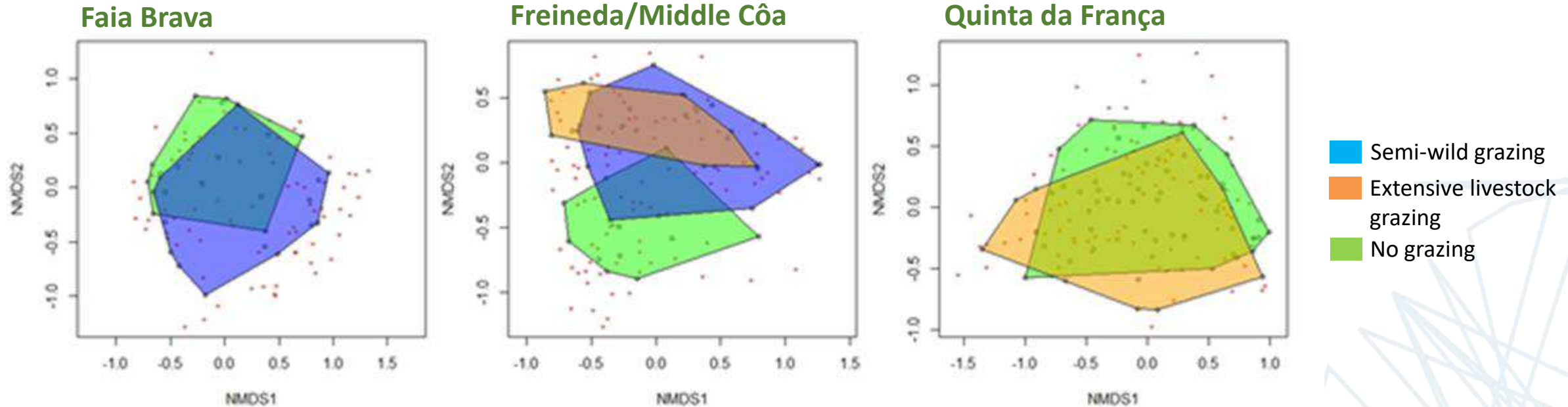
- Higher species richness in **Extensive livestock grazing** sites
- Stipa gigantea* (tall grass associated with fire prone landscapes) relatively abundant in **No grazing** sites
- 102 species in No grazing sites, 87 in Semi-wild grazing sites and 123 in Livestock grazing sites

Quinta da França



- Species richness levels were equivalent for both grazing regimes
- Cytisus sp.* was dominant in both grazing regimes.
- 109 species in No grazing sites and 112 in Livestock grazing sites

RESULTS - PLANT COMMUNITY COMPOSITION



Faia Brava and Quinta da França

- Ecological space of communities' composition with large overlap in grazed and ungrazed sites

Freineda/Middle Côa

- Composition of ungrazed communities is distinct from the composition of extensive grazed communities
- Semi-wild grazed communities are intermediate between livestock grazing and ungrazed communities

TAKE HOME MESSAGES

Wildfire Prevention

- Grazing regimes with overall **contribution to wildfire prevention**, creating fuel discontinuity and reducing fuel loads.

Plant Species Diversity

- Most grazing systems with **good performance in supporting plant diversity**, when compared to abandoned areas.

Tree Recruitment

- **Impacts** from grazing shown in **tree recruitment** do not seem to be concerning at the landscape scale but may suggest the need for **additional protective measures**.



Thank you!



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