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Dealing with highly fuzzy landscapes: how to assess  
High Nature Value Farmland  
in Mediterranean silvo-pastoral systems

Teresa Pinto Correia, Sérgio Godinho, Nuno Guiomar,  
Carla Azedo, Carlos Guerra

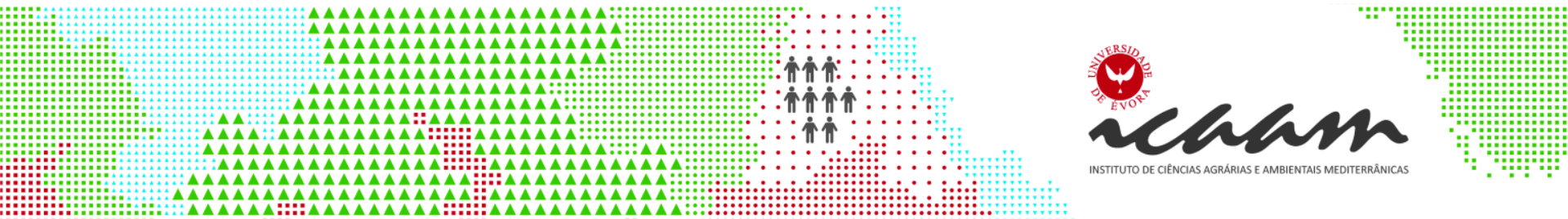
*ICAAM / Universidade de Évora*

S45 “Shaping landscape ecology approaches in  
different regional contexts”



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# The MONTADO: Mediterranean silvo-pastoral system extensive land use, several layers, functional complexity, high spatial fuzziness



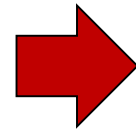
*UPEV*

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**1,2 M ha in Portugal**  
**3,0 M ha in Spain**

As other wooded pastures and agroforestry systems, *Montados* are over-mature and suffer recruitment failure

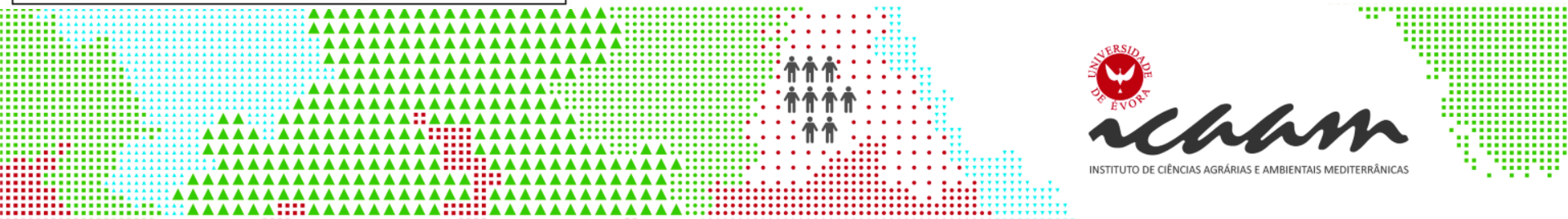
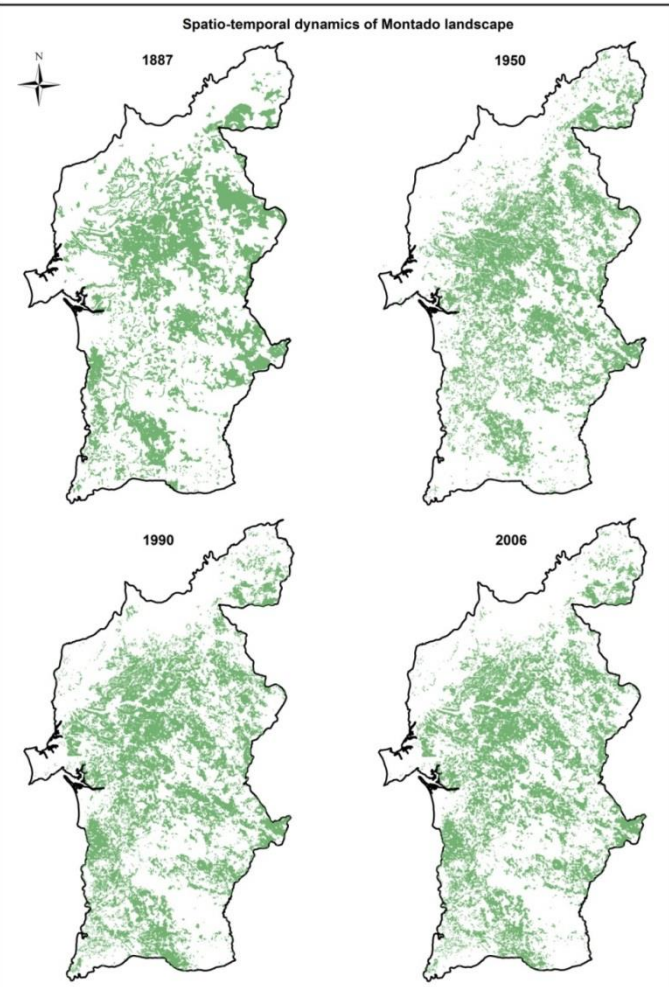
...showing a significant decline:



**1990 - 2014 - 5000 ha/year**  
**mainly canopy cover decrease**

**Due to**  
increasing grazing intensity  
replacement of sheep by cattle  
replacement of autoctonous by heavy breeds  
deeper machinery ploughing

» **FARM MANAGEMENT SHIFTS**  
» **A PROGRESSIVE, UN-SEEN PROCESS**



# Urgency of public intervention

- Targeting of policy measures
- Need for effective identification and classification of sustainable management at farm level

**High Nature Value farmland:** *areas in Europe where agriculture is a major land use and sustains or is associated with either a high species and habitat diversity, or the presence of species of European conservation concern, or both*

**»» NON-COMPETITIVE FARMING PRACTICES, DESERVING SPECIFIC SUPPORT**

Low intensity farming characteristics

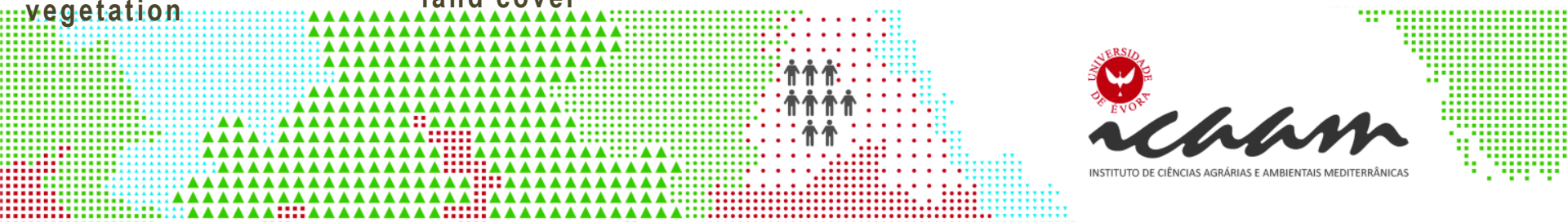


HNV

Presence of semi-natural vegetation

Diversity of land cover

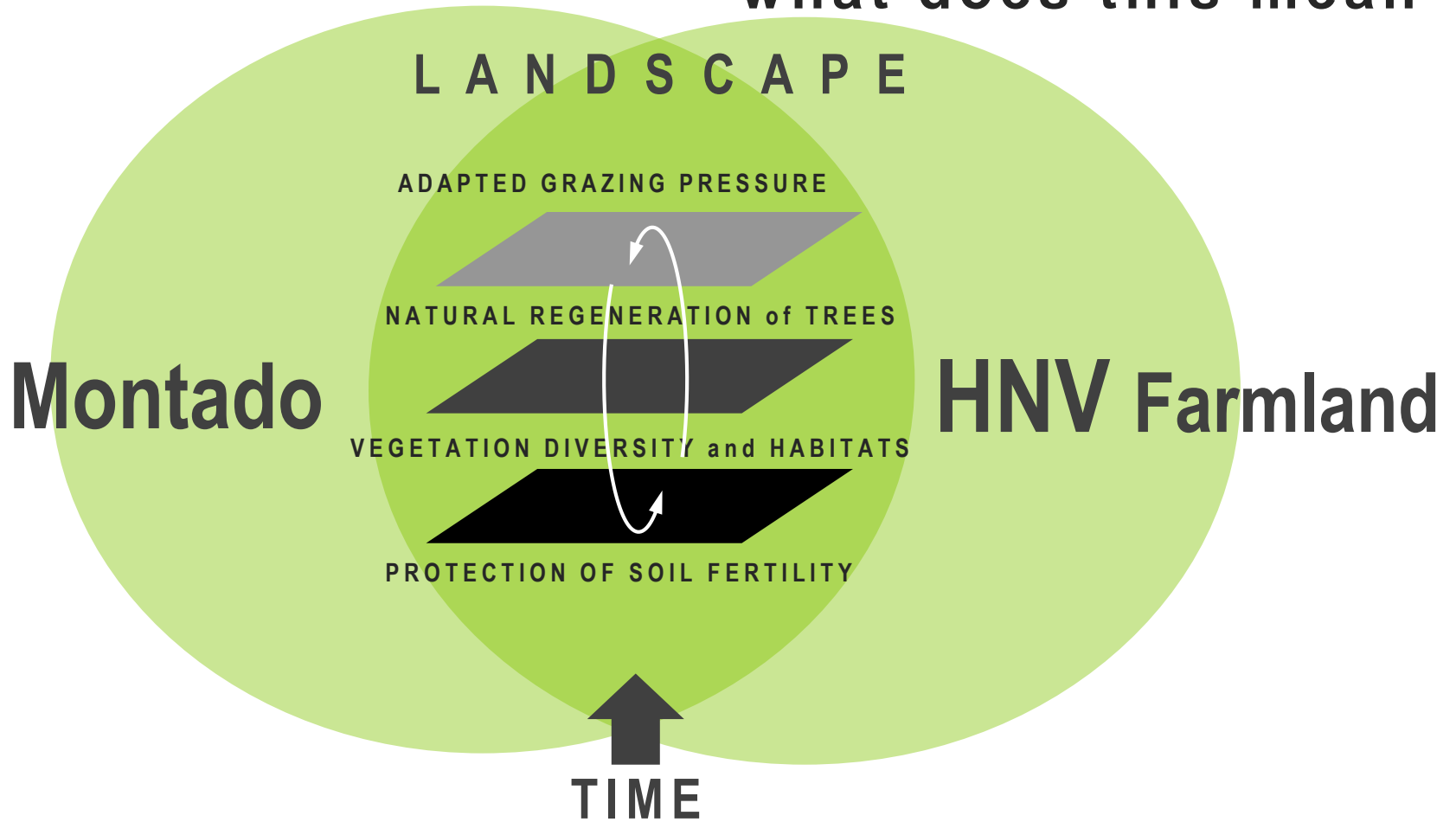
**Type 1 HNV = with high proportion of semi-natural vegetation**



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# Sustainable Management of the Montado: what does this mean ?



how to identify it ?



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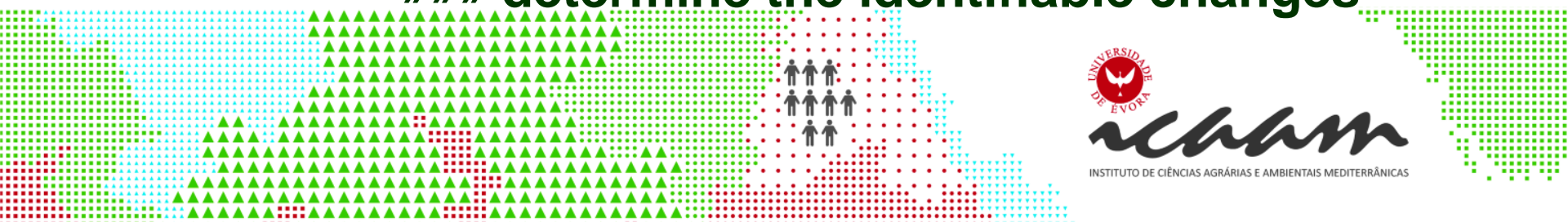
# WE NEED consistent classification of a complex and fuzzy landscape pattern



boundaries are not pre-defined

scale + definition + decisions on boundaries

»»» determine the identifiable changes



**the classes considered  
are determinant  
[slow changes / at tree level]**



**D**  
>50% Dense Montado



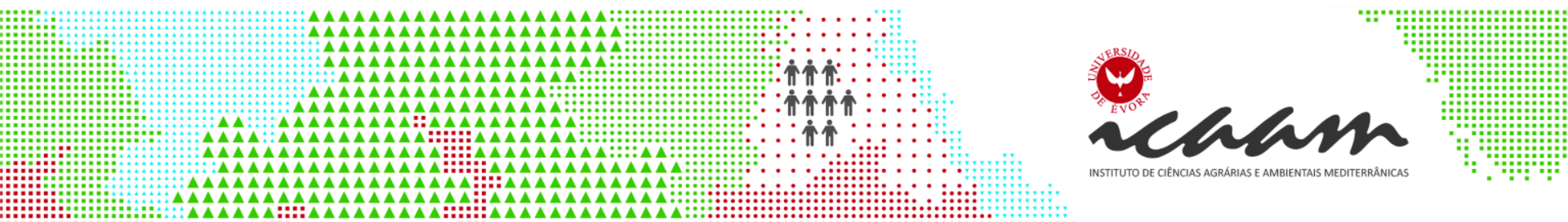
**C**  
20 – 50% Open Montado



**B**  
10 – 20% Clear Montado



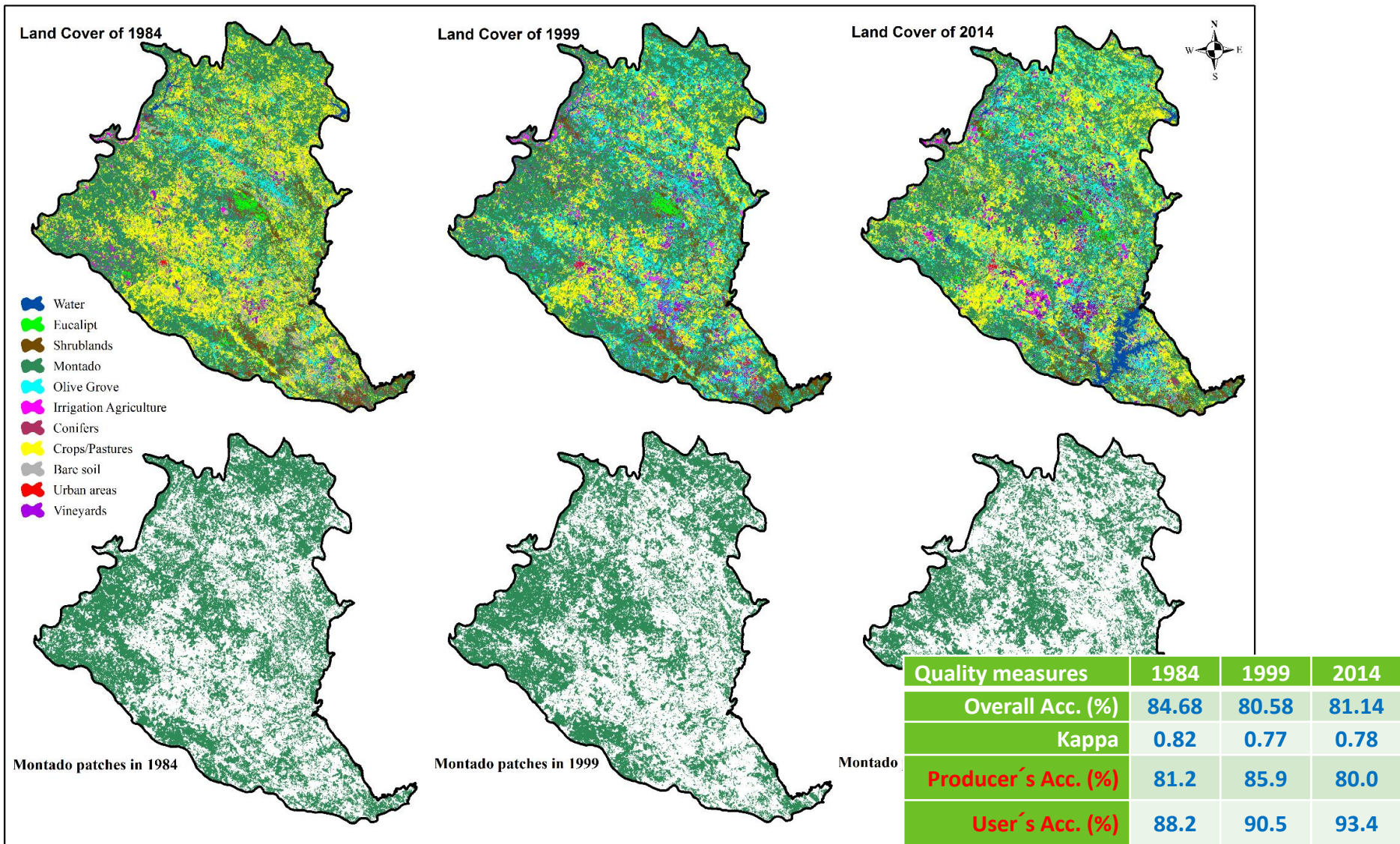
**A**  
< 10% Open Pastures



*uham*

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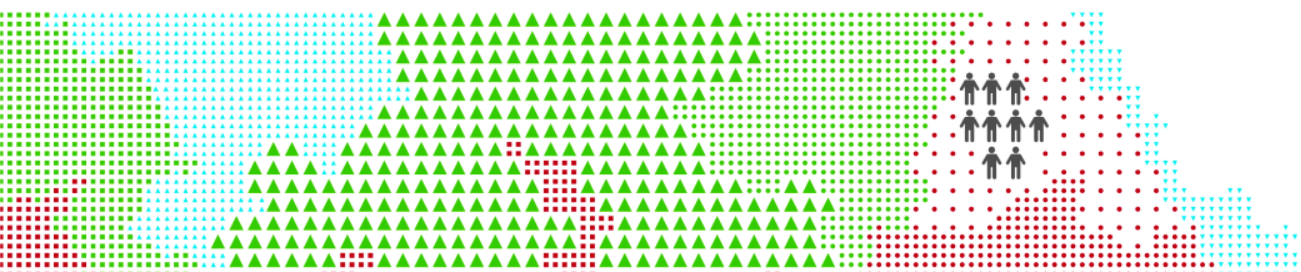
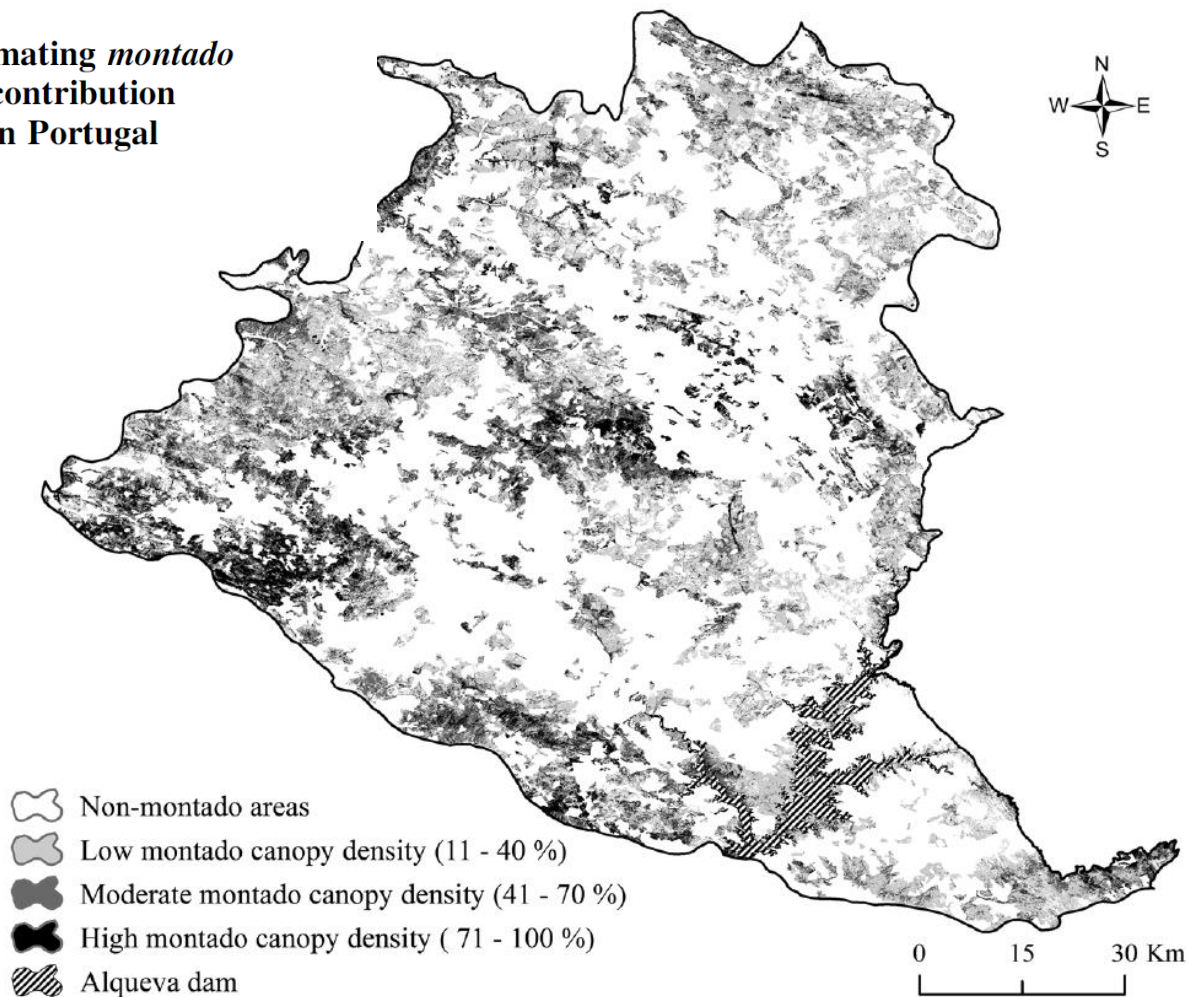
# use of satellite data : a step forward





# A remote sensing-based approach to estimating *montado* canopy density using the FCD model: a contribution to identifying HNV farmlands in southern Portugal

Sérgio Godinho · Artur Gil · Nuno Guiomar ·  
Nuno Neves · Teresa Pinto-Correia

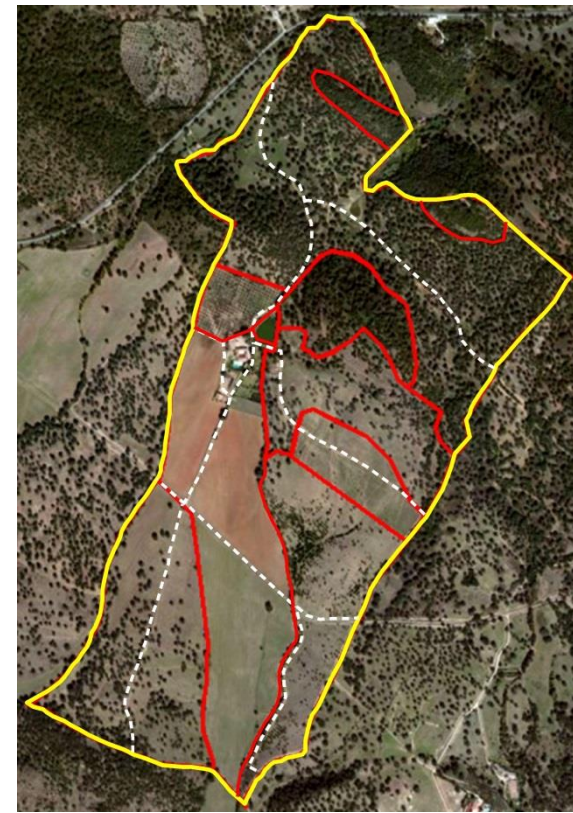
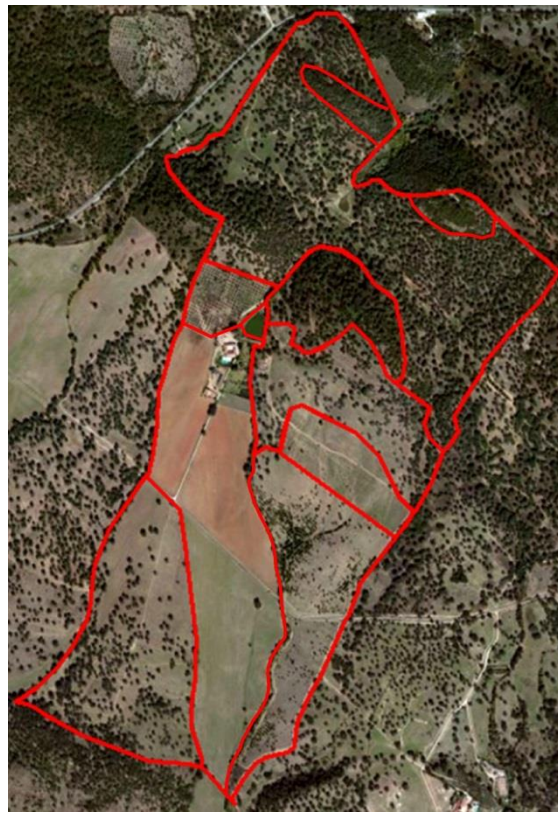


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# WE ALSO NEED to know practices, so we can:

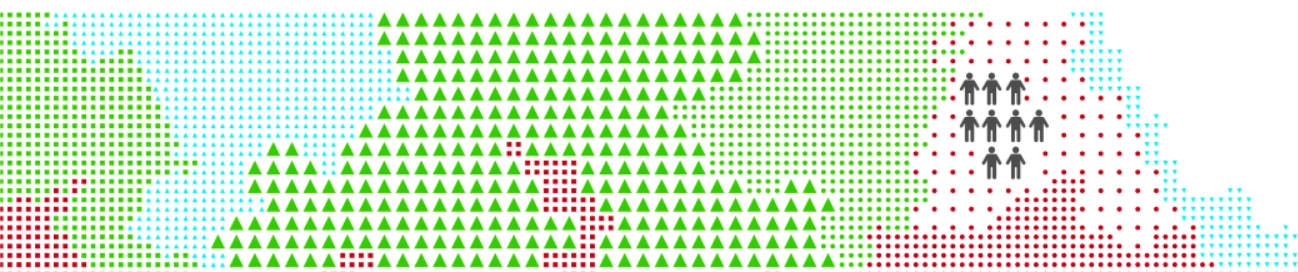
- **assess**  
under cover diversity  
habitat preservation  
recovery after summer drought  
soil condition
- \* **inform policies**



## 1) link landcover pattern to farm / plot structure

### How ?

- the patch boundaries are not the same
- the plot boundaries are frequently changing



# WE ALSO NEED

2) obtain data on management practices at the plot level

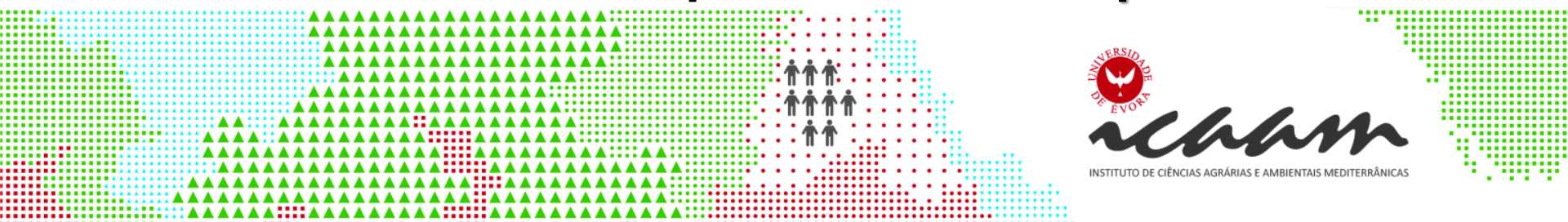
## How ?

- »» high variability in management
- »» no data at the plot level, even with direct farm survey (management is constantly adapting)

at the landscape level we know that grazing practices (stocking rates and grazing species) are particularly relevant:

»» *Montado* fragmentation and heterogeneity

but decisions are taken at the farm level and implemented at the plot level



# Assessing management practices: the farm as the minimum unit

Agroforest Syst  
DOI 10.1007/s10457-014-9778-2

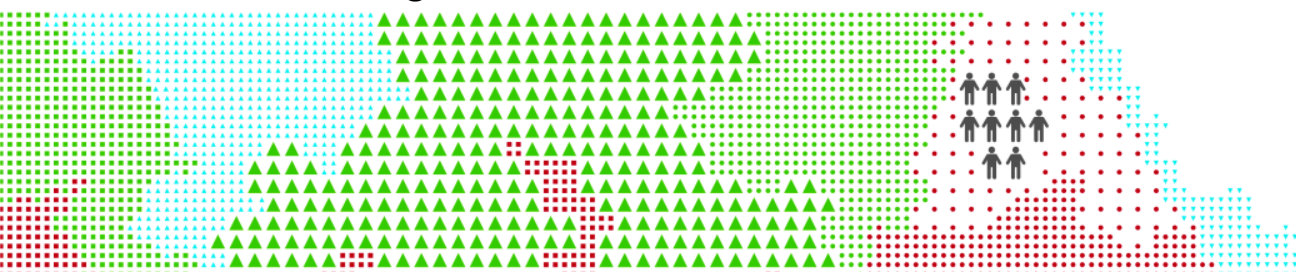
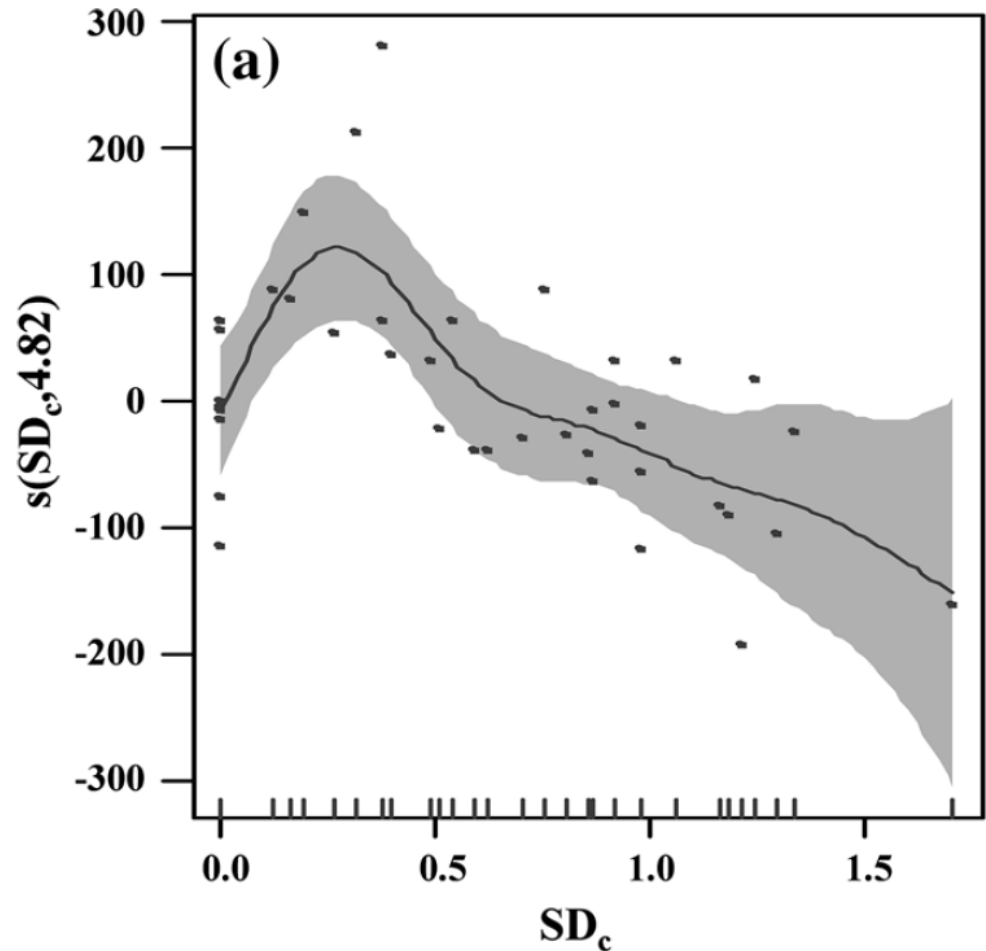
## The effects of grazing management in *montado* fragmentation and heterogeneity

Mara Almeida · Carla Azeda · Nuno Guiomar ·  
Teresa Pinto-Correia

Spline line and 95 % confidence band for  $SD_c$  (stocking density for cattle) explaining *montado* fragmentation (expressed as **effective mesh size at farm level**)

$$m = \frac{1}{A_t} \sum_{i=1}^n A_i^2$$

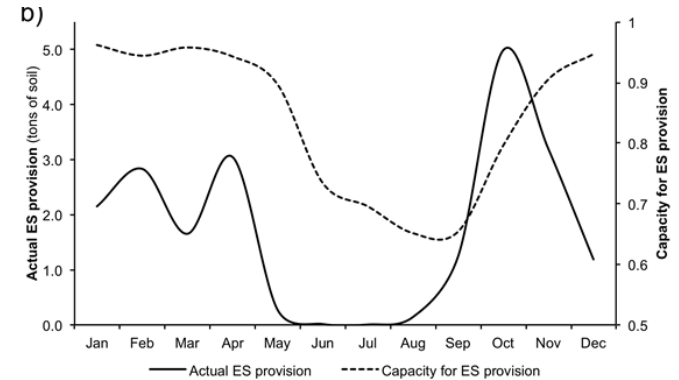
where  $A_i$  is the size of the existing *montado* patches in a given management unit and  $A_t$  is the total area of that management unit



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**Farm management**  
previous practices have shown to be highly determinant to:  
the capacity of recovery of vegetation  
after the summer drought,  
the soil organic matter  
the diversity of species

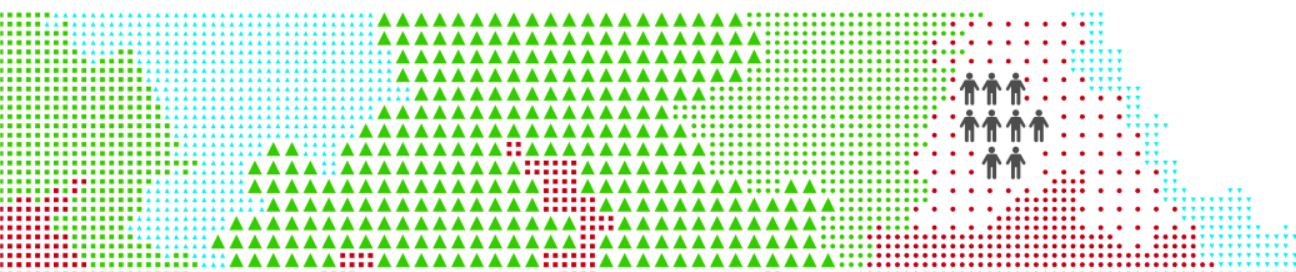


**AND THUS WE NEED**

**3) to add a temporal dimension to the analysis**  
*still need to define the time span*

**How ?**

we do not have the data  
we do not have the methods



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**Which challenges for landscape ecology ?**

**if we want to be relevant for practice,  
more than the pattern, foccus on the processes**

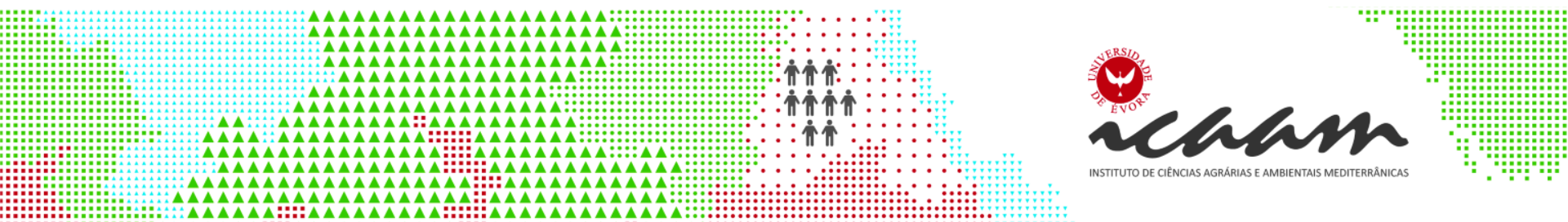
**1) Relieable classification of fuzzy landscape patterns ✓**

**2) Link landscape pattern to management functioning**

**3) Link the spatial and temporal dimensions**

**so that we can assess adaptation of management  
practices to each specfic biophysical context**

**– at the plot level**



# Thanks

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[www.silvopastoral2016.uevora.pt](http://www.silvopastoral2016.uevora.pt)



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