Expansió i densificació del bosc en un context de canvi global:

el cas del pi negre (*Pinus uncinata*)

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Components of global change...

Atmospheric changes

- CO_2 (+1.5 ppm/year)
- N deposition (25kg/ha/y)
- Ozone (2.4% yearly)
- UV radiation

Invasive species

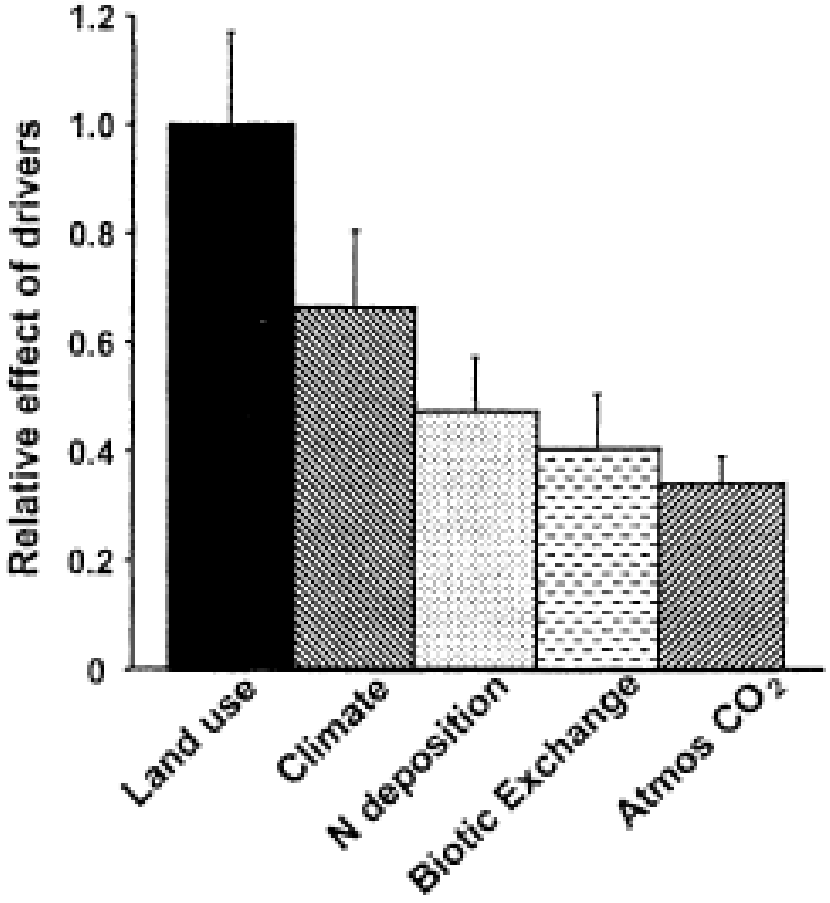
Land-use changes

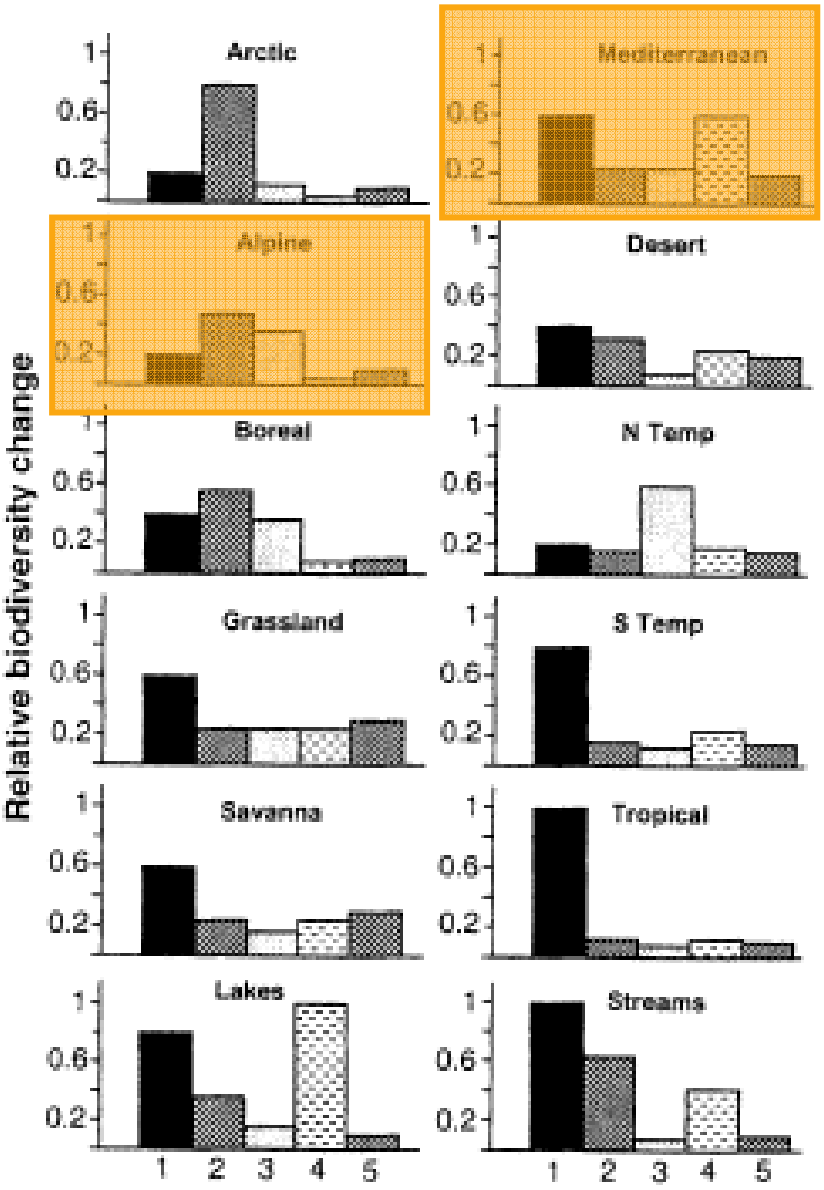
- overexploitation
- agriculture abandonment

Climate change

- temperatures
- Precipitation
- disturbance regimes

...in Mediterranean mountains



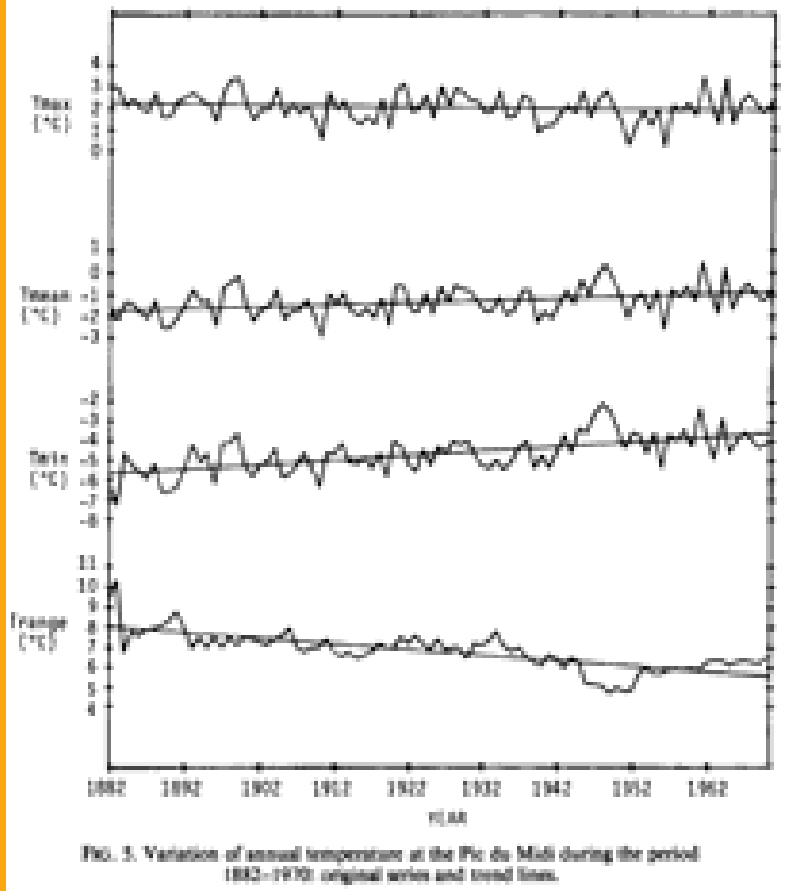


Sala et al. (2000). Science

Recent global change in the Pyrenees

Climatic changes

Tmean: +0.83ºC
Tmin: +2.11ºC

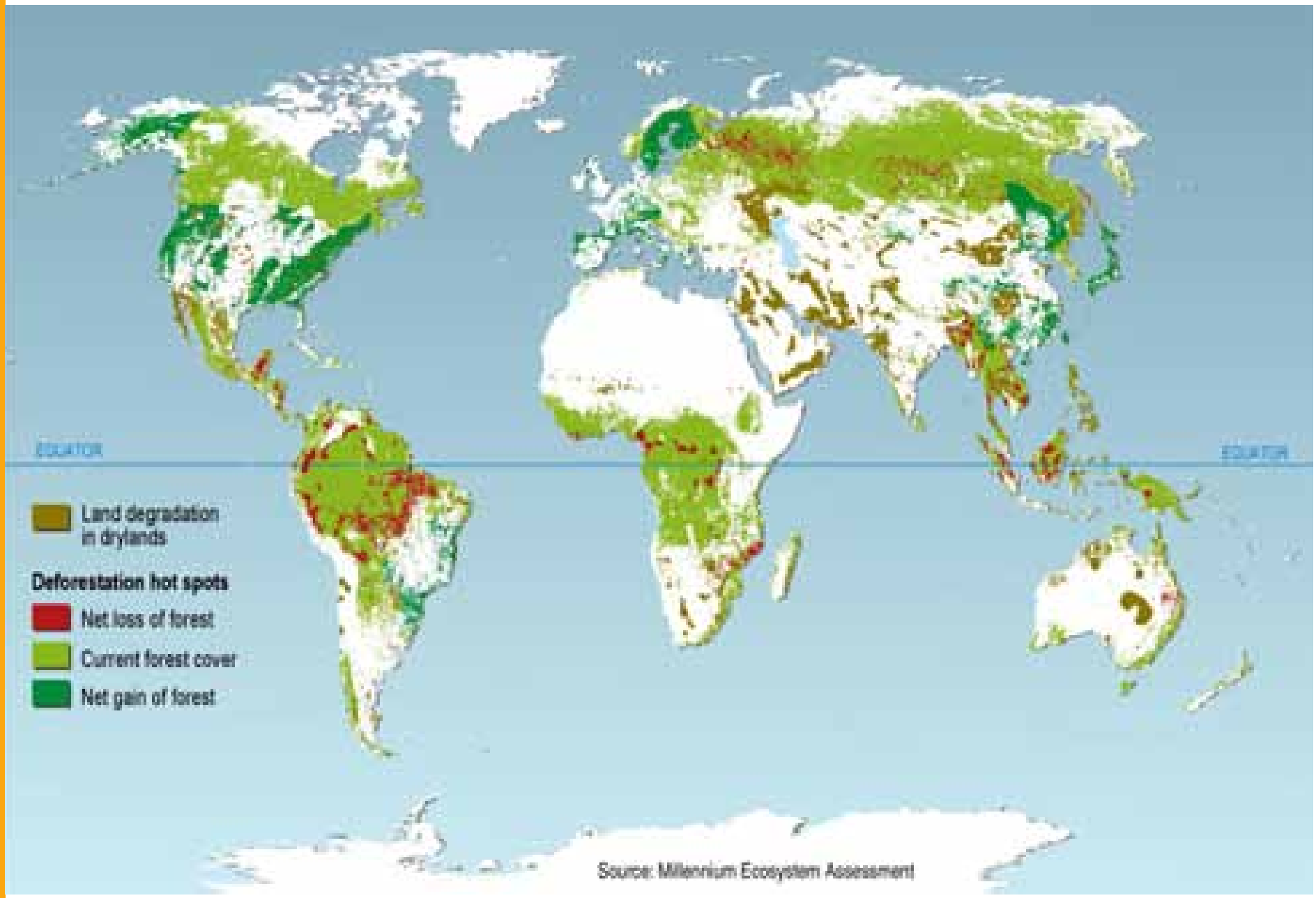


Bücher & Dessens (1991)

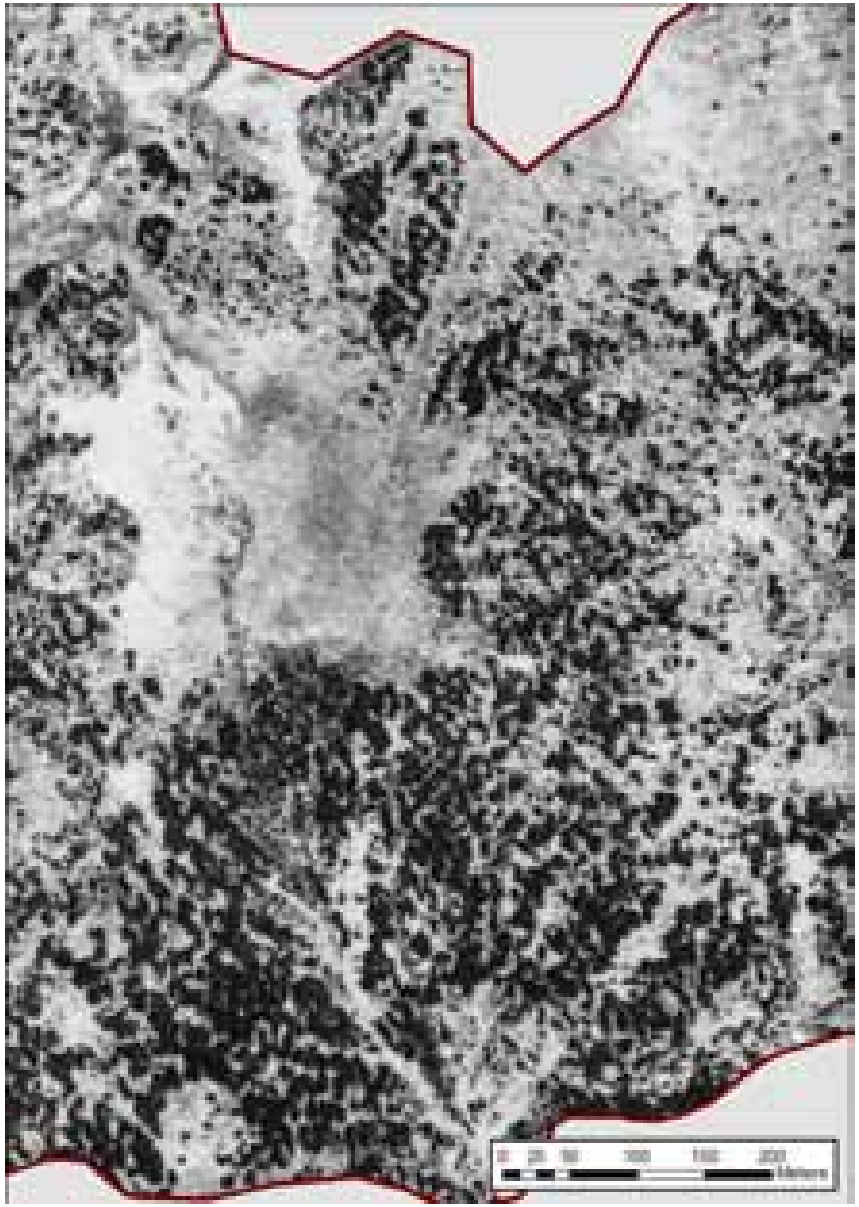
Demographic, economic and organizational changes

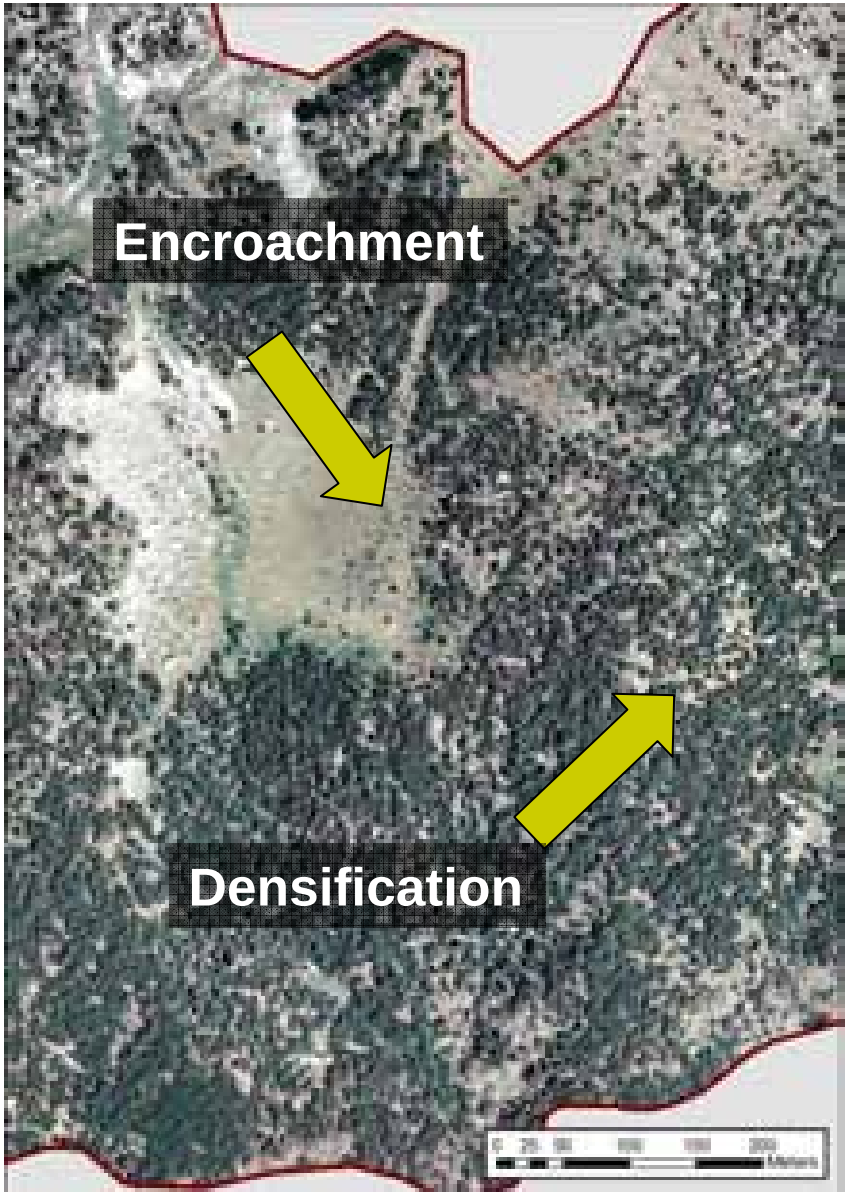
Molina (2002)

... leading to forest expansion



Components of forest expansion





Objectives

Which is **the role of climatic and land-use changes** in forest expansion?

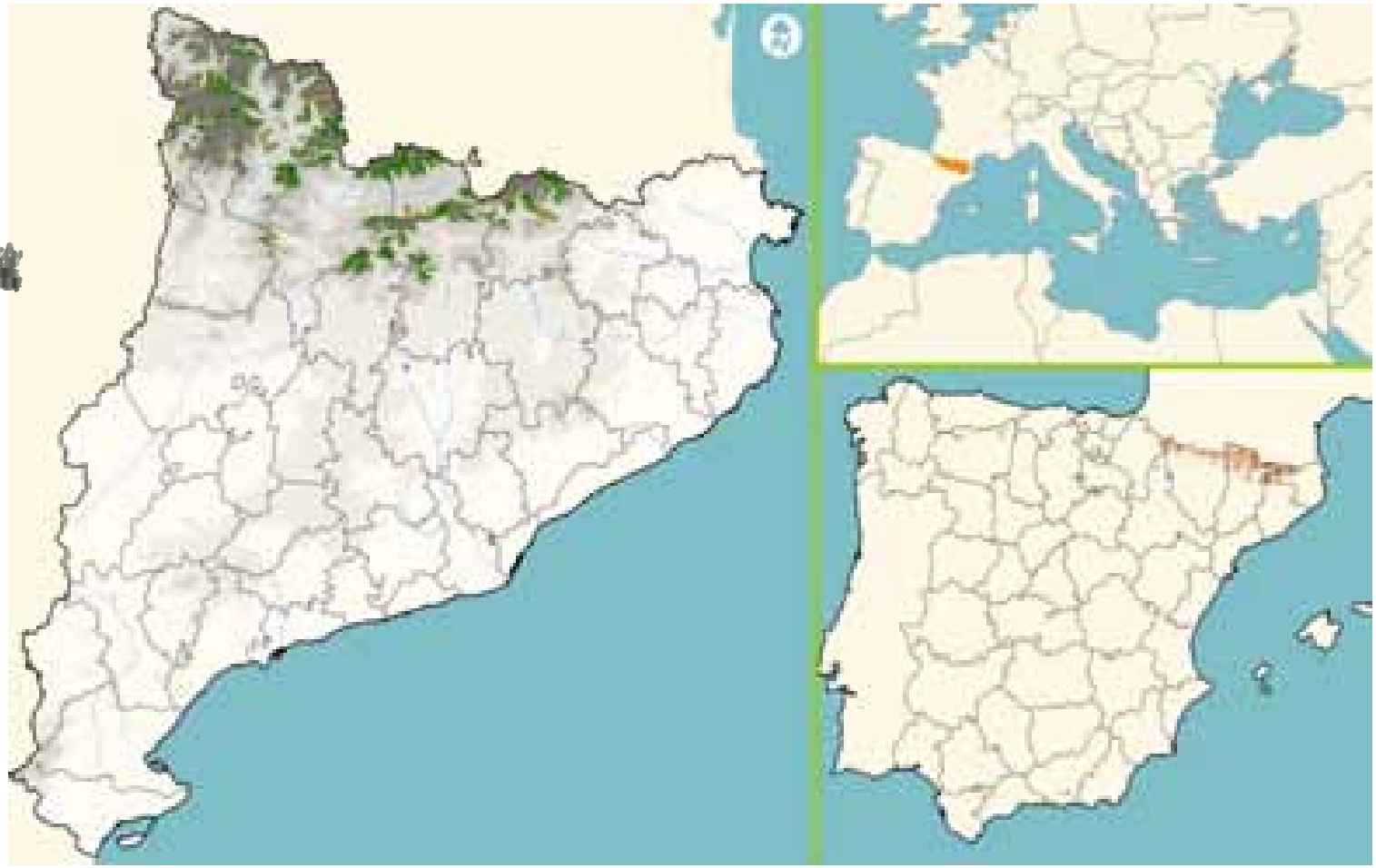
- Assess the **spatial patterns** of the forest expansion at both local and regional scales

- Infere, from these spatial patterns, the main **driving factors:**

    - If **climate** is the main driver, the expansion will be more important **near the treeline**
    - If not, spatial patterns of expansion should **match patterns of land-use change**

Species: *Pinus uncinata*

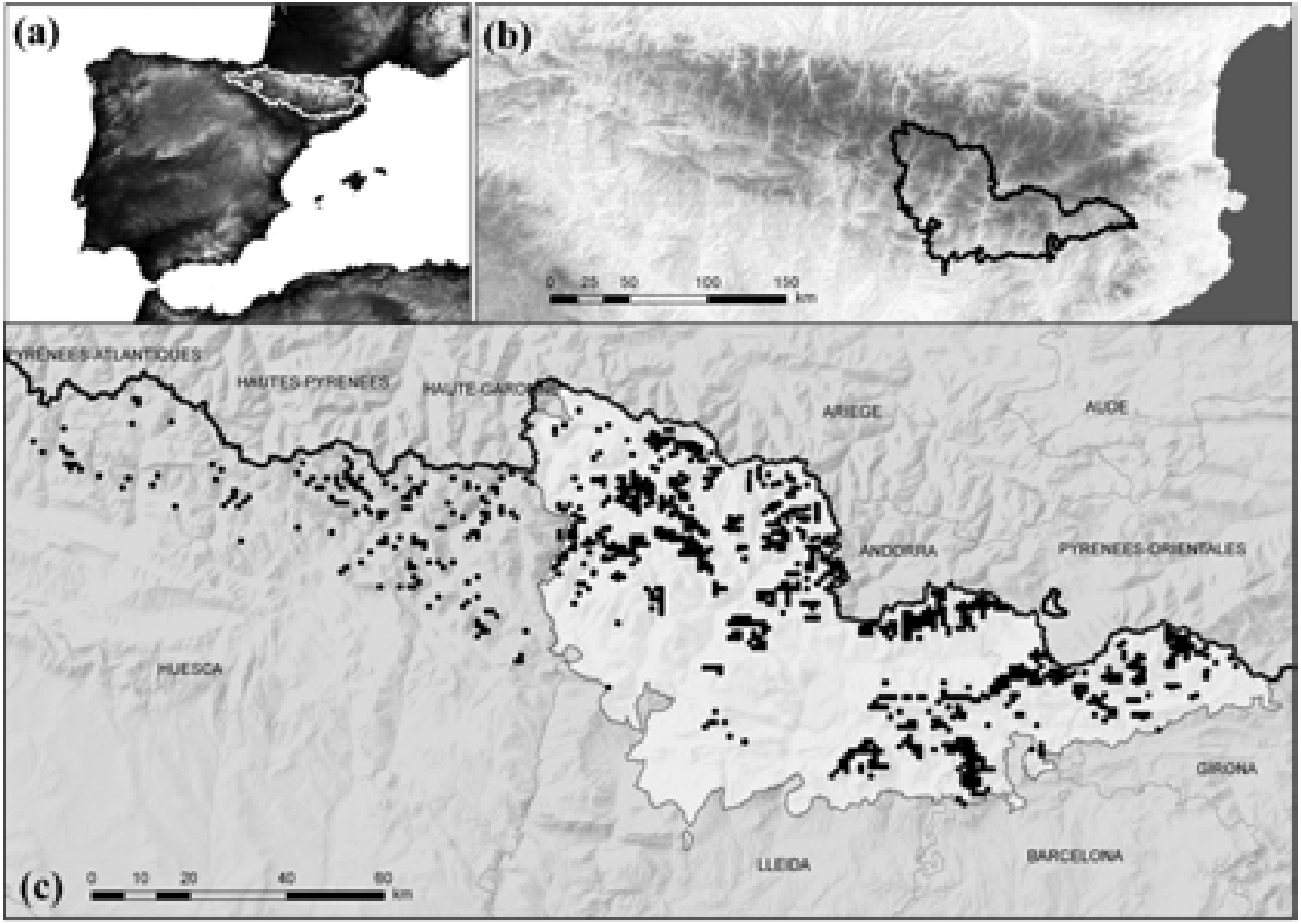
Subalpine belt (most of the Pyrenean treelines)



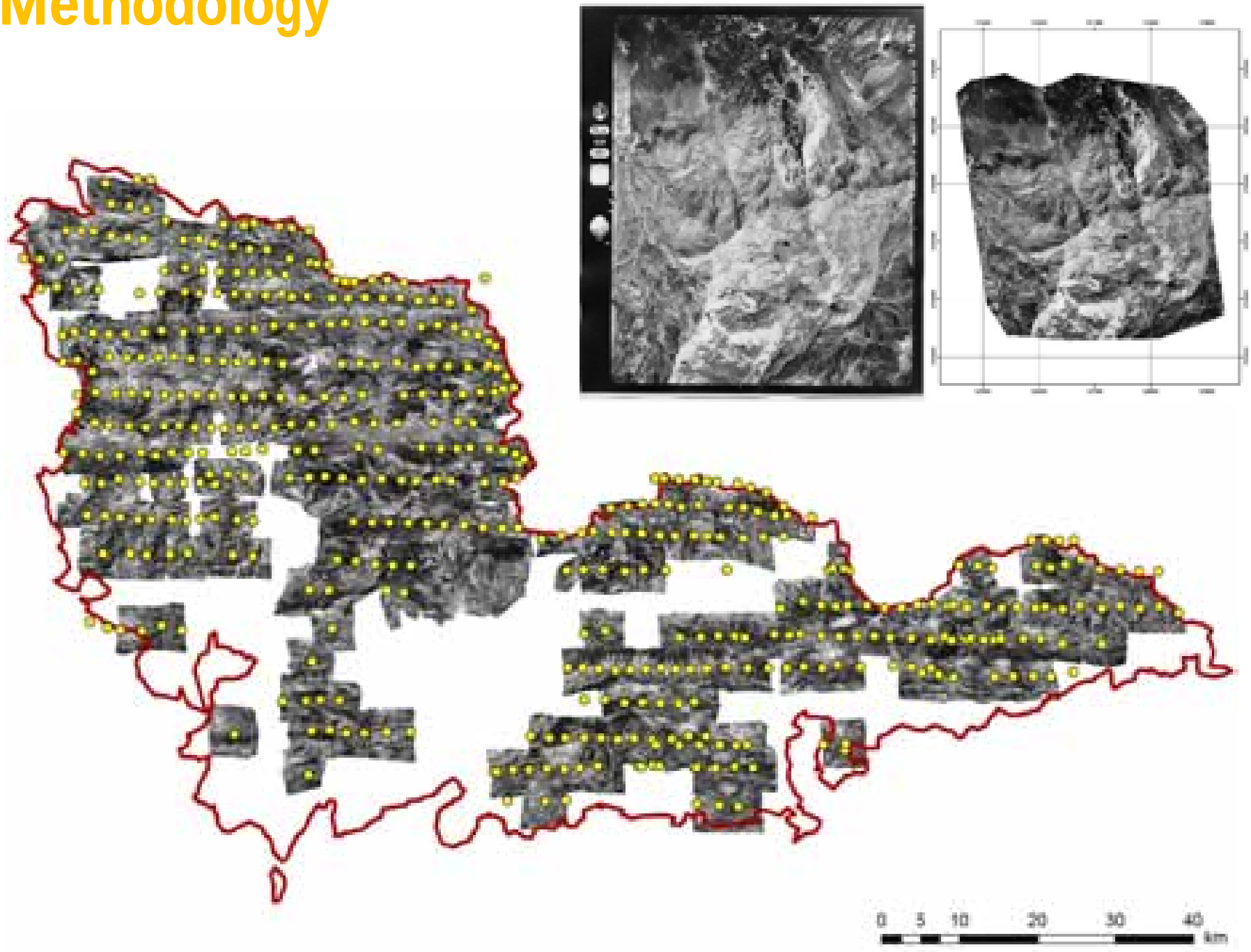
Vericat et al., 2010; Piqué et al., 2011

Methods: area of study

83 municipalities. 65.000 ha. (75% distribution Pyrenees)

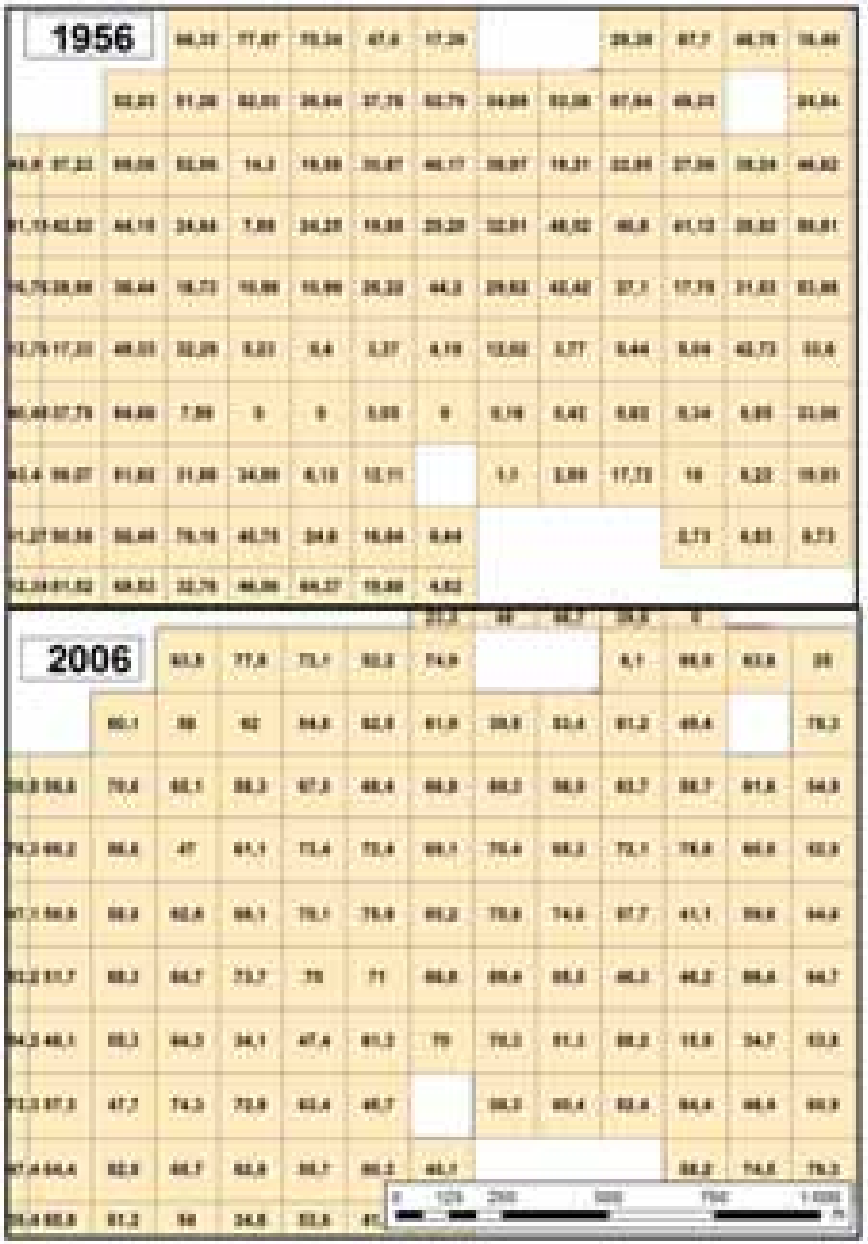


Methodology



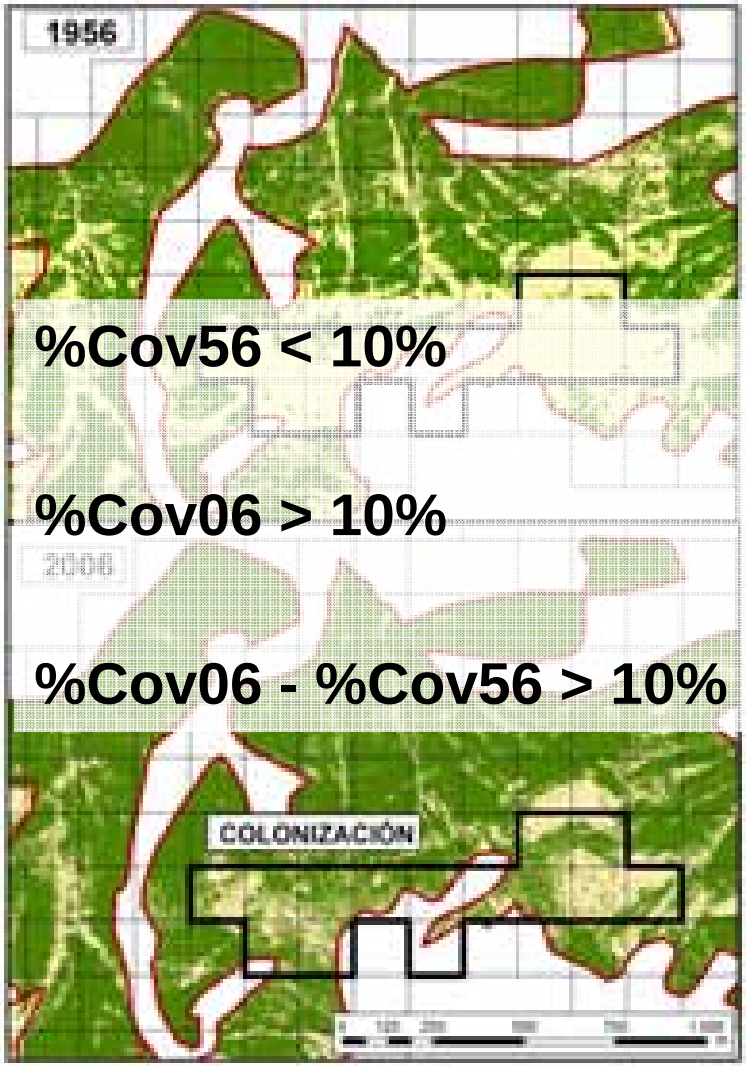
Methodology

- Map of Habitats of Catalonia
- Grid (150x150 m)
- Supervised classification
- Assessment of %Cov56; %Cov06

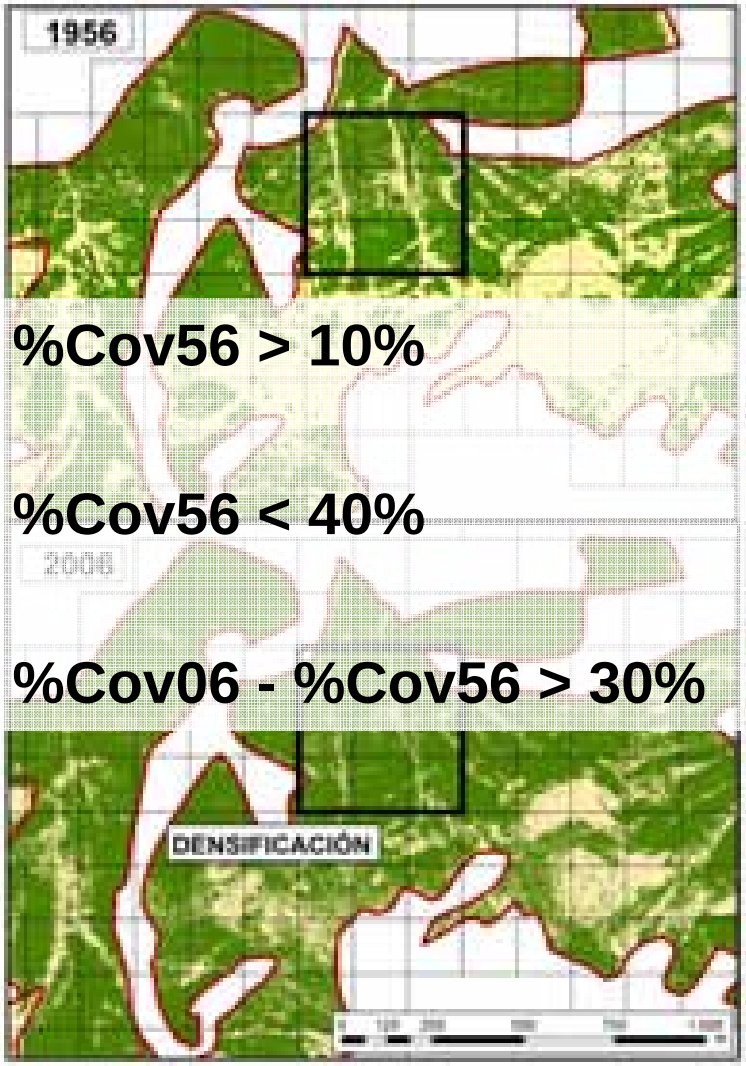


Methodology

Encroachment

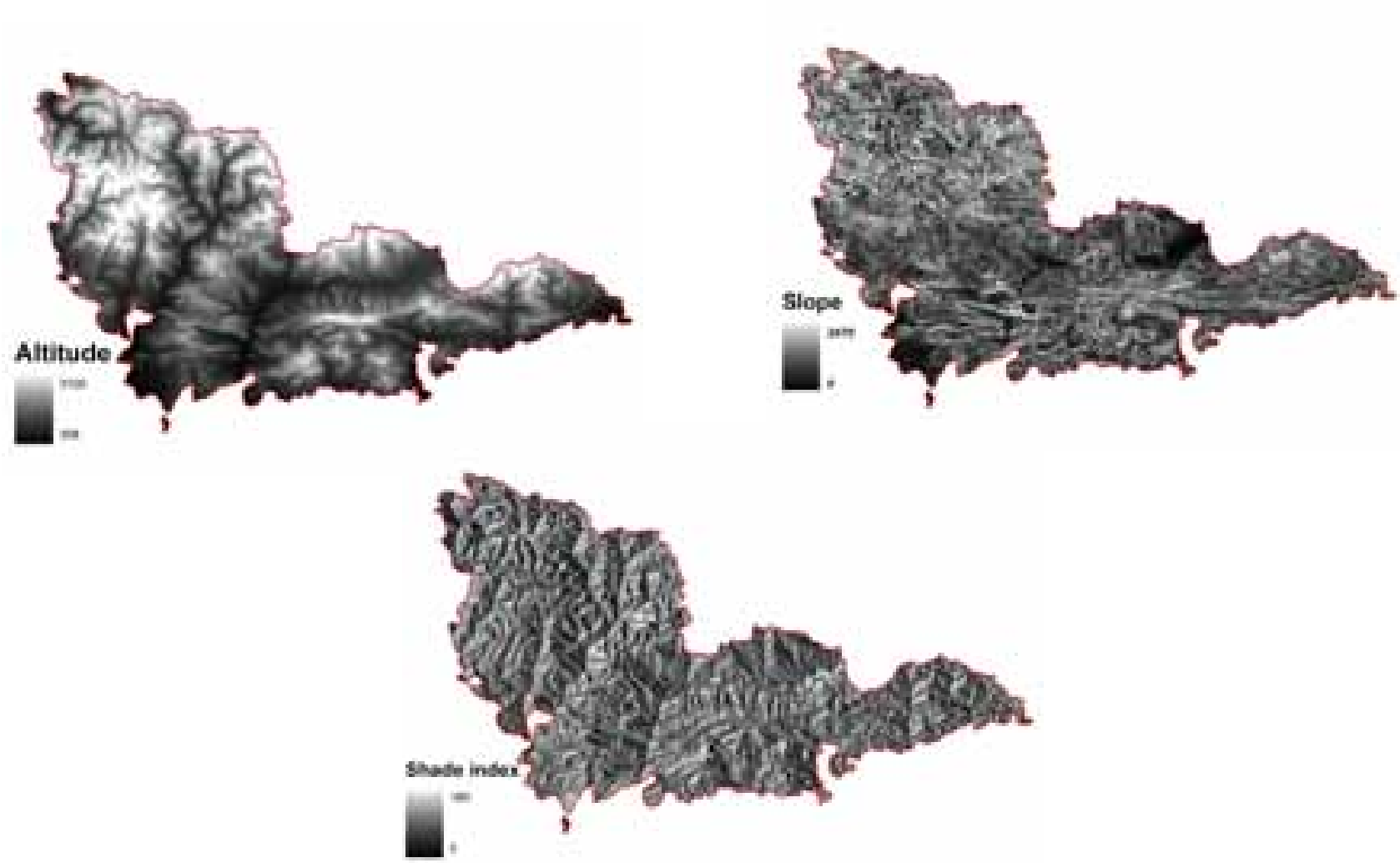


Densification



Methodology: explanatory variables

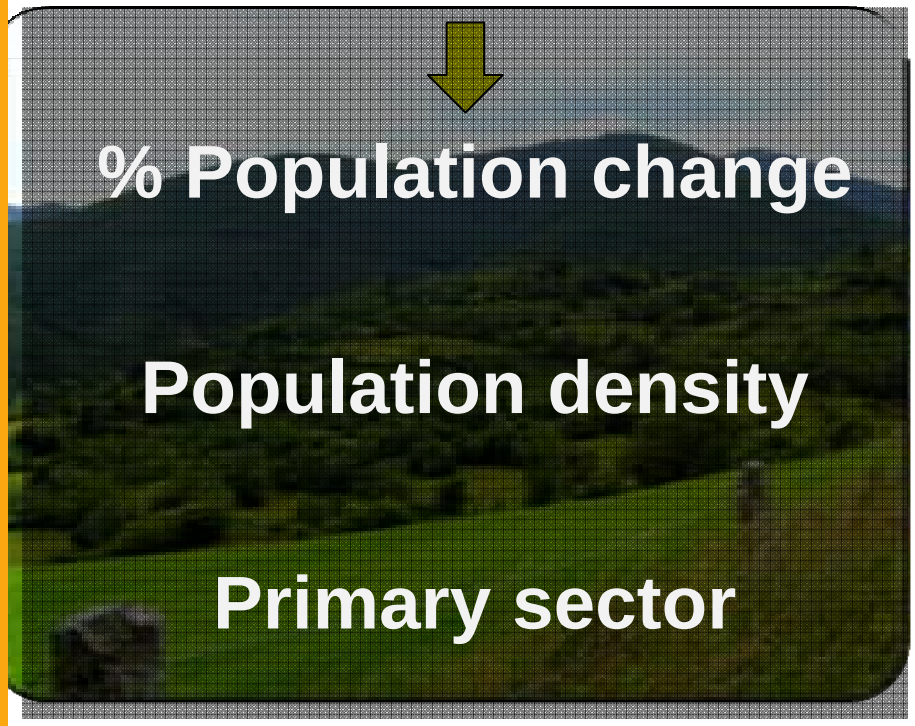
Topographic factors (local scale)



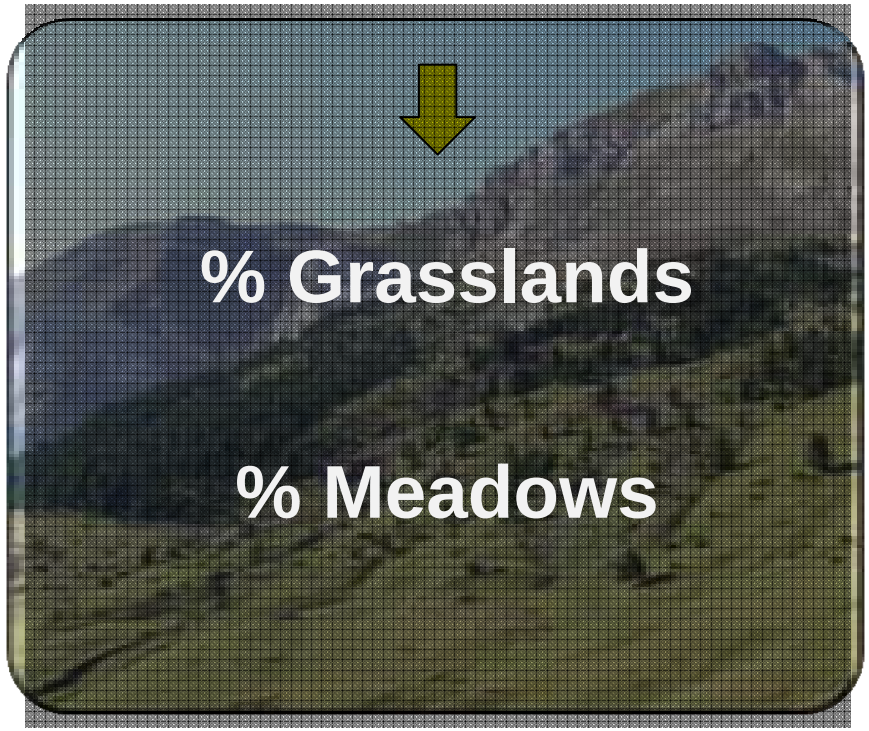
Methodology: explanatory variables

Socioeconomic factors (municipality scale)

Farmland abandonment

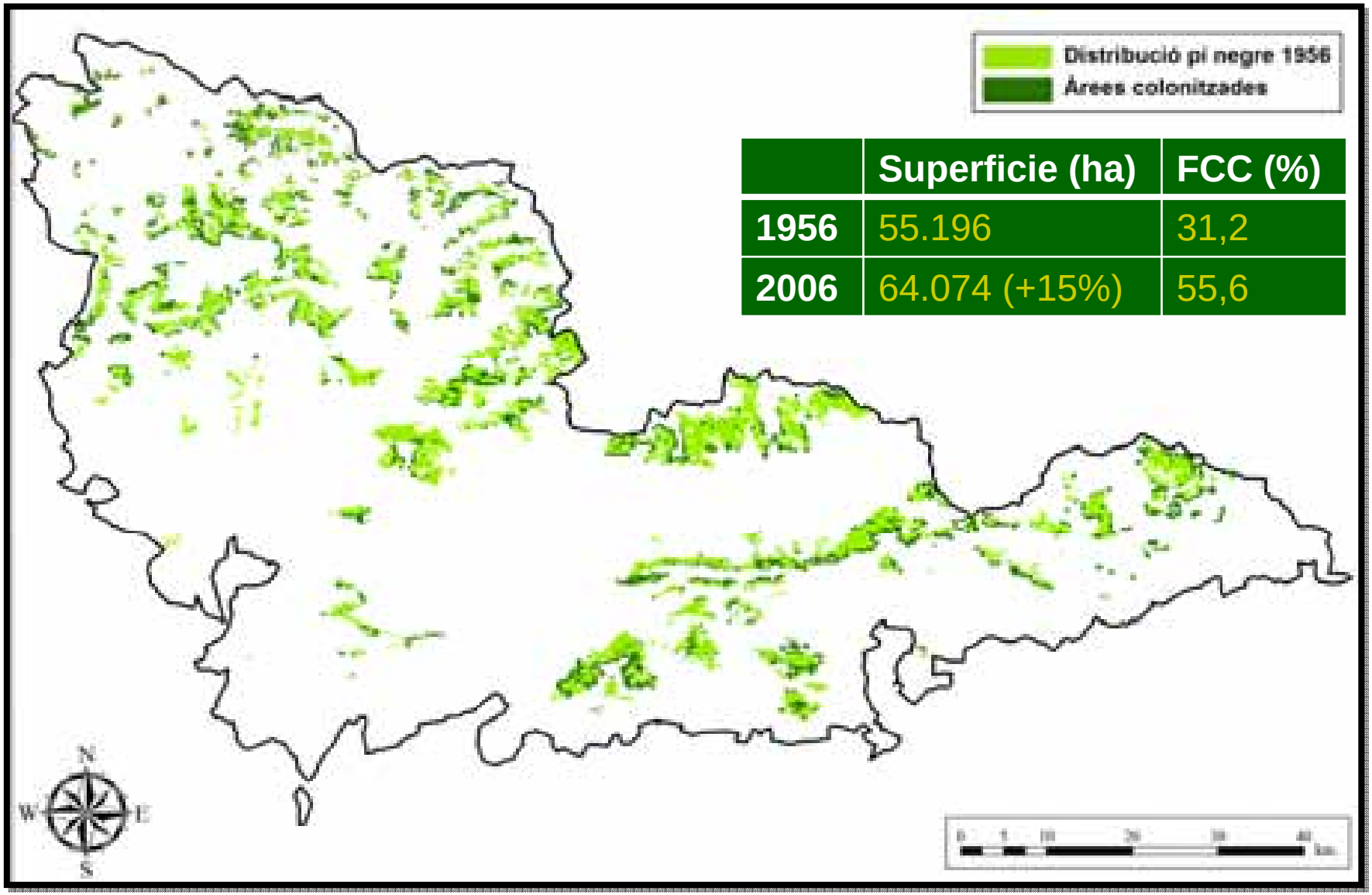


Livestock charge



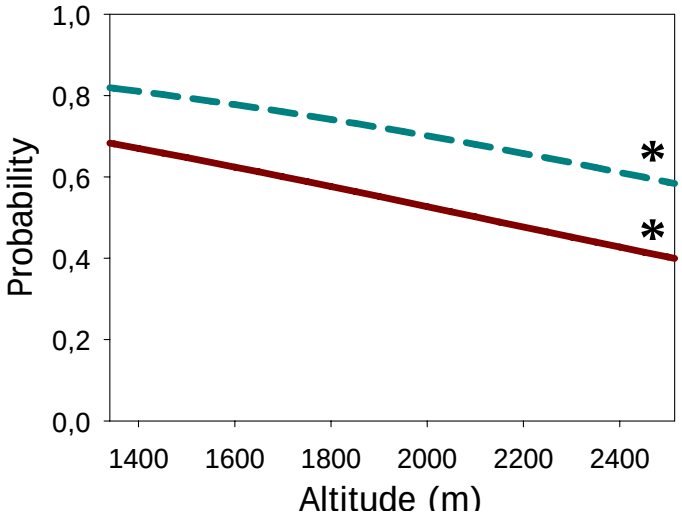
PROXIES

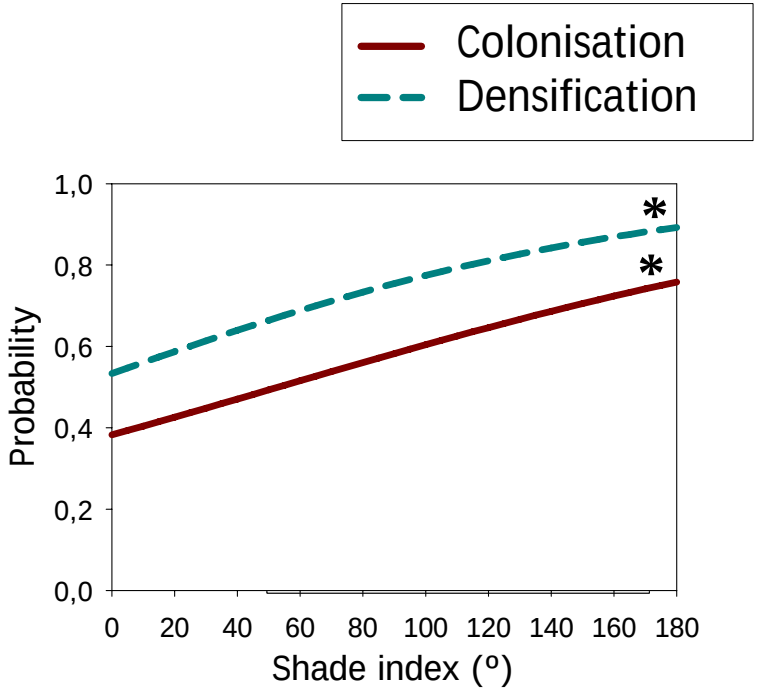
Results

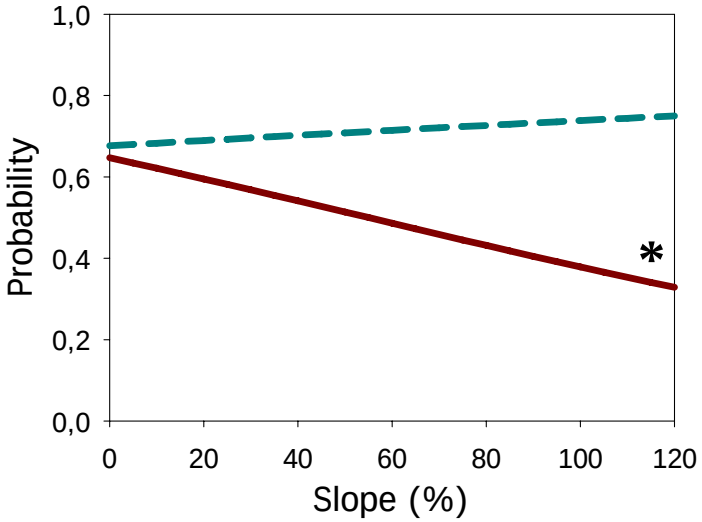


	Superficie (ha)	FCC (%)
1956	55.196	31,2
2006	64.074 (+15%)	55,6

Results: topography







- Increasing encroachment and densification in low altitudes and northern aspect.

Ameztegui et al (2010) Glob. Ecol. Biog.

Interpretation

Higher encroachment rates in:

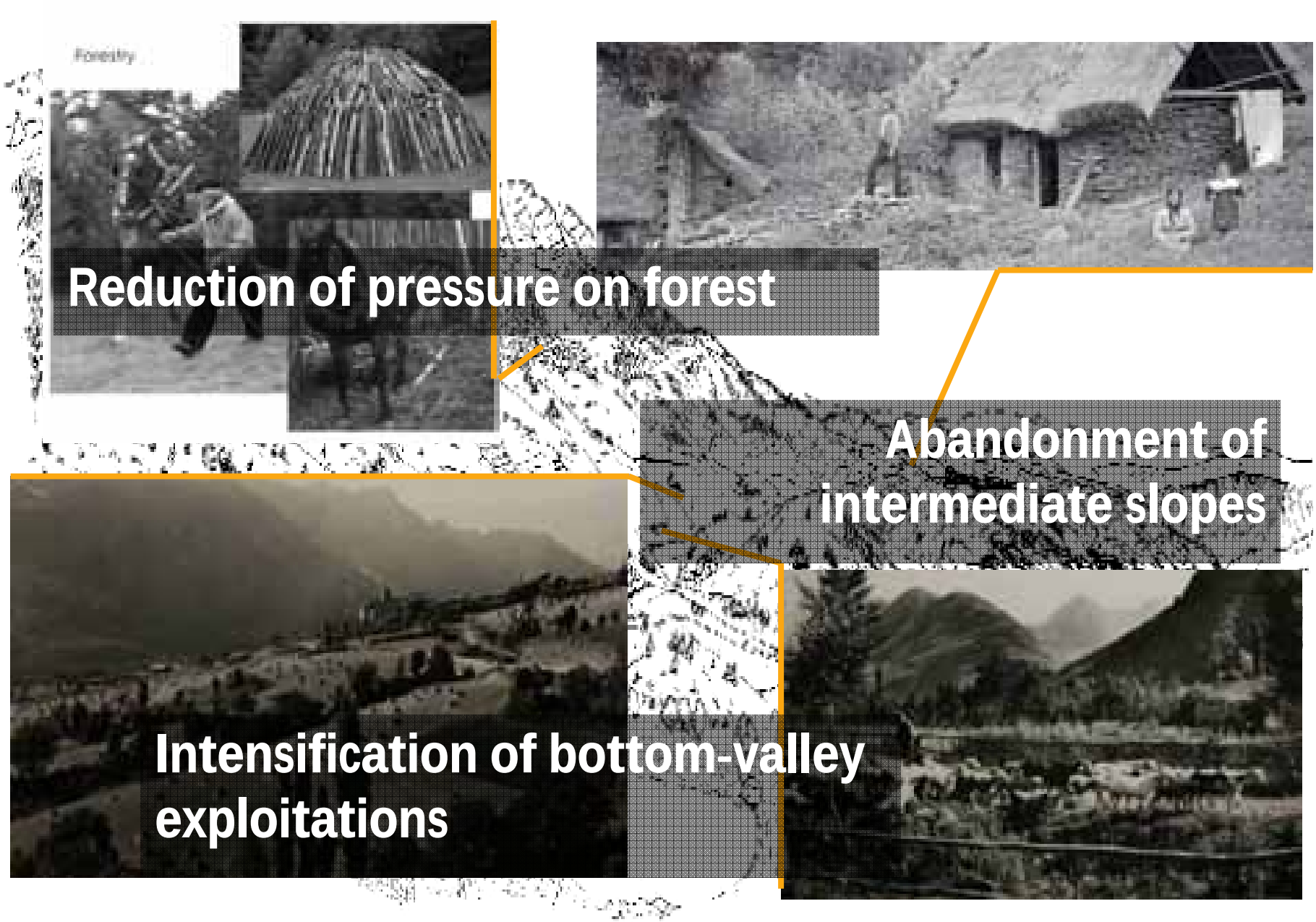
- North aspect
- Low elevation (<1600 m)
- Low slope

→ An effect of site conditions? (neither thermal nor hydrological limitations)

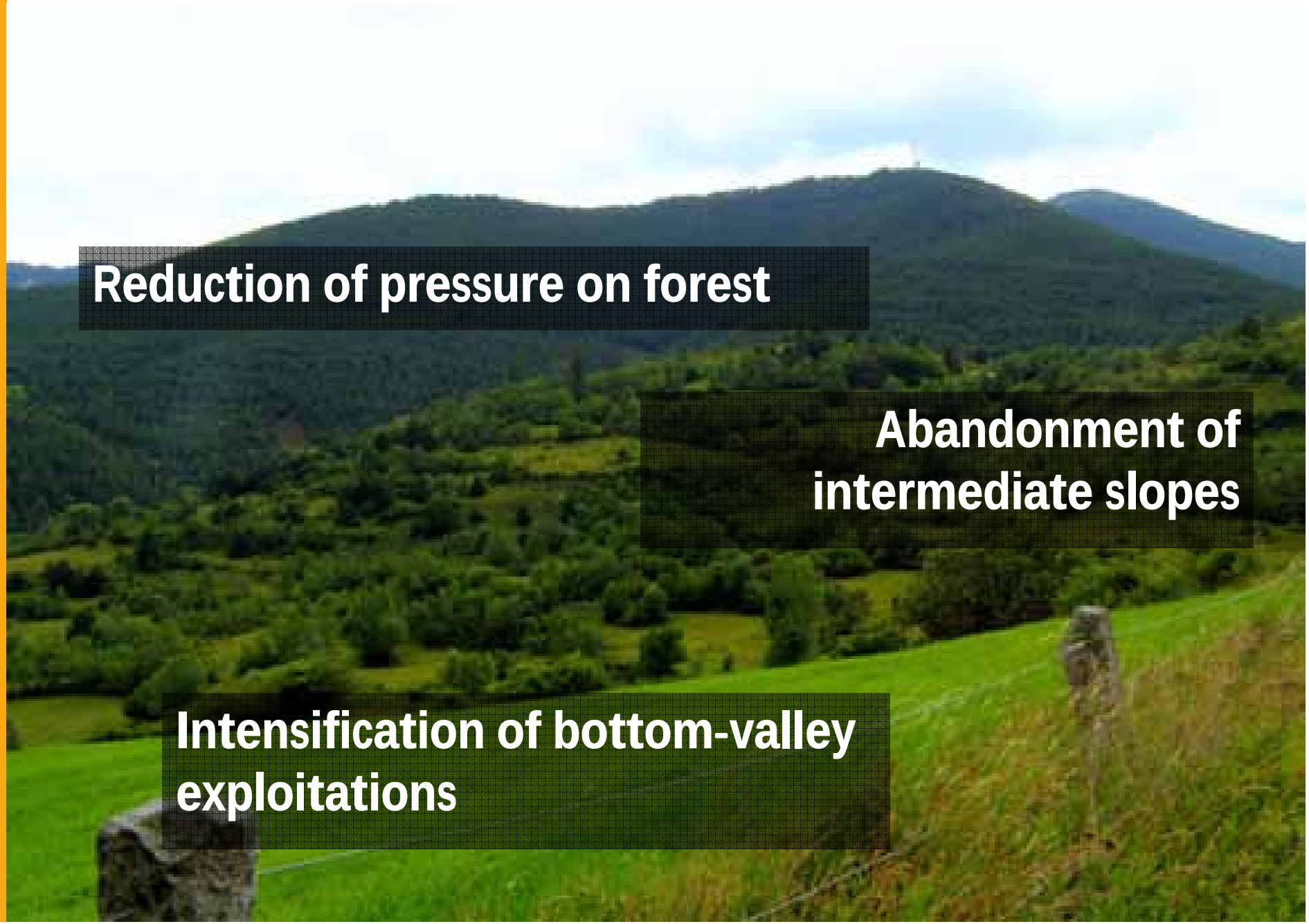
BUT

Topography is not independent from patterns of land-abandonment and livestock grazing

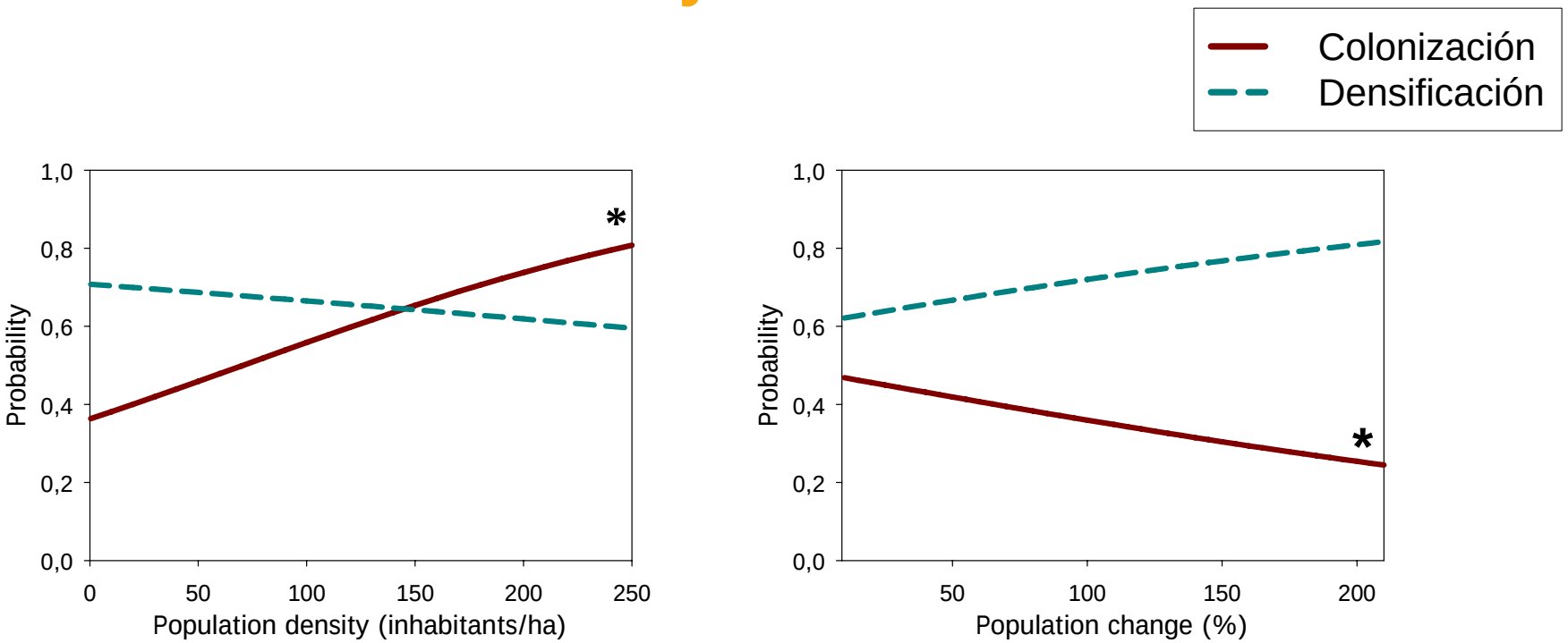
Traditional LU in the Spanish Pyrenees



Current LU in the Spanish Pyrenees



Results: socioeconomy



- Higher colonization in mun. with high density and high population losses
- Lower colonization in mun. with high % grasslands
- No effects on densification

“Take home” messages

- **Important expansion** of *Pinus uncinata*

- Spatial patterns match with those of disminution of **anthropic activities** (farmland and grazing)

- Doesn’t mean a lack of influence of climate

- Stresses the importance of considering land-use changes


Thank you!
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