

Dipartimento di Scienze Botaniche, Ecologiche e Geologiche  
UNIVERSITA' DEGLI STUDI DI SASSARI




## Impact of abandonment on High Nature Value pastures of Sardinia

**Emmanuele Farris**  
Dept. of Sciences for Nature and Environmental  
Resources  
University of Sassari (Sardinia – Italy)  
*emfa@uniss.it*

### Notes for instructors and users

Emmanuele Farris (University of Sassari, Italy) provided this presentation to HNV-Link Project. The HNV-Link project team adapted it for inclusion in the educational package on High Nature Value farming. Notes are based partly on the information in the listed sources. Other resources of the education package are available [www.hnmlink.eu](http://www.hnmlink.eu)

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- Introduction to Sardinia
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- Pasture types
- Case-study: Abandonment of the hilly-montane sheep pastures and wooded pastures
- Management, Conservation and Restoration

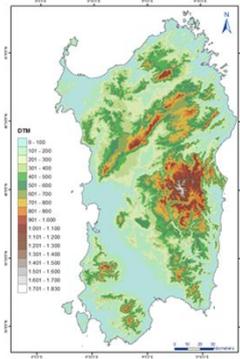
## Sardinia

- the second largest island in the entire Mediterranean sea
- central part of the western Mediterranean Basin.



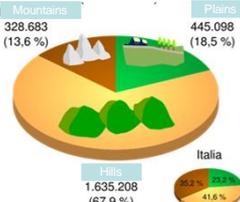
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Surface: 24,090 Km<sup>2</sup>  
Inhabitants: 1,672,422 (2008)  
Density: 69.4 people/Km<sup>2</sup>  
Sheep: ~5,000,000 (1990)  
Highest mountain:  
Gennargentu (1832 m asl)

Topography	Area (Km <sup>2</sup> )	Percentage
Mountains	328.683	13,6 %
Plains	445.098	18,5 %
Hills	1.635.208	67,9 %



Italia

Zambrini - Source: one of the following Public Domain data sources: ETCPD (Resolution 1" = 1.6km) GLOBE (Resolution 30" = 0.9km) SRTM (Resolution 3" = 90m). Description: Topography of Sardinia, created with GMT 4.1.3. CC BY-SA 3.0. [https://commons.wikimedia.org/wiki/File:Sardinia\\_topo.png](https://commons.wikimedia.org/wiki/File:Sardinia_topo.png)

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## Human history

- Ancient civilization of "Nuragic" people (5,000-200 B.C.)
- Phoenicians (1500-235 B.C.)
- Romans (235 B.C. – 496 A.C.)
- Vandals (496–550 A.C.)
- Bizantins (550–800 A.C.)
- Independent Middle Age states (800-1410 A.C. )
- Catalans – Aragons – Spanish (1354-1720 A.C.)
- Piedimont Savoia (1720-1861 A.C.)
- Italy (1861 A.C.-today)

*People lived mainly on the coasts*

*Arabian attacks forced people to move to interior areas*

*People moved again to the coasts*

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## Modern economy



Shepherding in the interior areas, tourism on the coasts

Sheep grazing around Lula, Nuoro.  
By Rafael Brix, CC-BY-SA-3.0  
[https://commons.wikimedia.org/wiki/File:Sheep\\_near\\_lula\\_sardinia.jpg](https://commons.wikimedia.org/wiki/File:Sheep_near_lula_sardinia.jpg)

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## Biodiversity

Estimated 2 500 vascular plant species: a floristic density of 103.5 species/1000 km<sup>2</sup> - higher than the average of the Mediterranean Basin (10.8 species/1000 km<sup>2</sup> -> a **biodiversity hot-spot** (Médail & Quézel 1999).

Plants: 347 species endemic to the island (14.4% of all plant species), of which 155 species are exclusive endemics (*sensu stricto*, 6.2%).

Examples of endemic animals:  
Sardinian brook salamander,  
Bedriaga's rock lizard, four endemic subspecies of birds.



By Franco Andreone, CC BY-SA 2.5.  
[https://commons.wikimedia.org/wiki/File:Euproctus\\_platycephalus01.jpg](https://commons.wikimedia.org/wiki/File:Euproctus_platycephalus01.jpg)

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### The regional context (southern Europe / Mediterranean)

In the last century people moved from south to north and from mountains to the coast

In mountain areas → In coastal areas

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    graph TD
      A[Abandonment of agro-pastoral activities] --> B[Decreasing of pastures]
      A --> C[Increasing of forests]
      D[Increasing of urbanization and mass tourism] --> E[Declining of dune vegetation]
      D --> F[Increasing of protection on cliffs]
  
```

Based on Falcucci, A., Maiorano, L., Boitani, L., 2007. Changes in land-use/land-cover patterns in Italy and their implications for biodiversity conservation. *Landscape Ecology*, 22: 617-631

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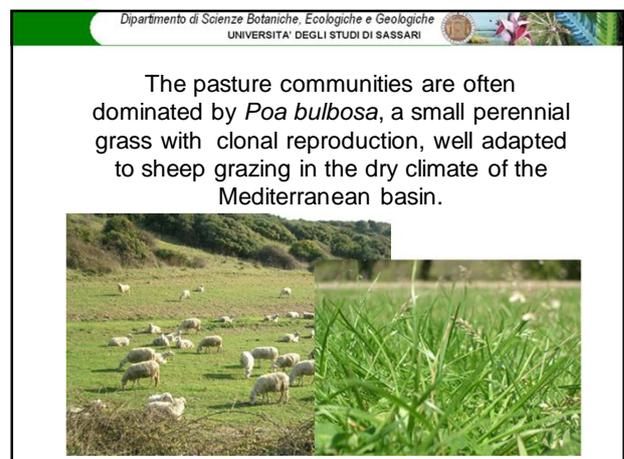
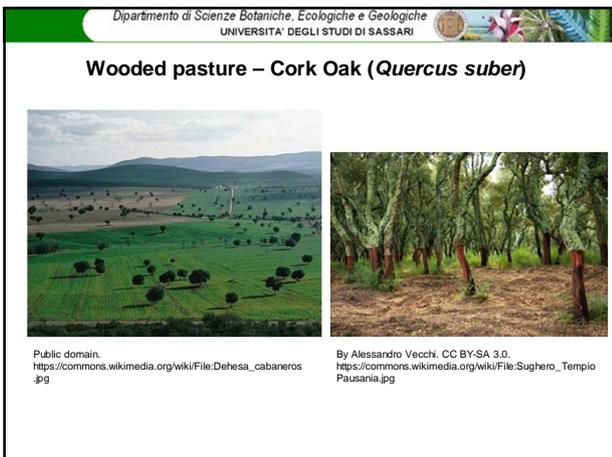
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### Pasture types in the Mediterranean:

- Grazed woodlands
- Dehesas
- Wooded pastures
- Open pastures
- Coastal pastures







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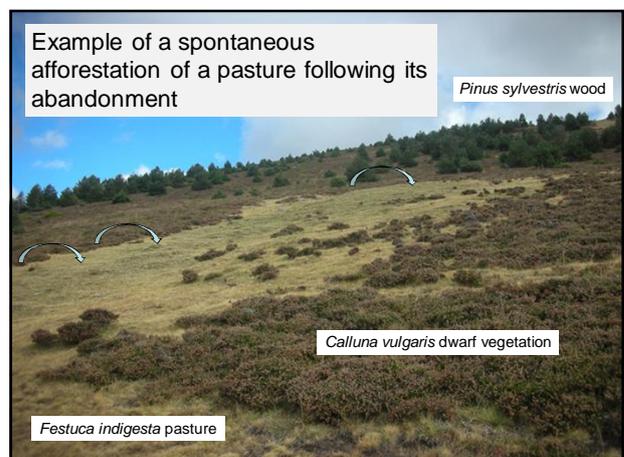
## Abandonment

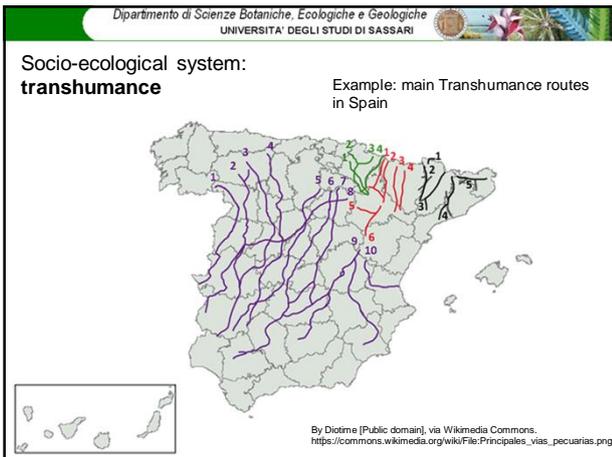
Severe negative effects on biodiversity and landscapes due to abandonment of traditional/extensive production systems - High Nature Value farming systems - in certain areas of particular conservation value (Peco et al. 2005; 2006).

28 out of 198 (14%) listed habitat types of the EU Habitat Directive (European Commission, 1992) - threatened due to the cessation of traditional low-intensity agricultural practices (Ostermann, 1998).

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- Western Mediterranean plant communities are adapted to the continuous treading and fertilization of sheep stock
- Composed of small-sized therophytes, geophytes, and hemicriptophytes, included in the phytosociological class of *Poetea bulbosae*
- Are characterized by high species richness
- Recognized as a major habitat for biodiversity conservation within the EU,
- Designated as 6220\*- Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea* in the EU Habitat Directive 43/92/EEC.





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**Impact of abandonment on**

- long-term scale >10 yrs (Kahmen *et al.*, 2002; Peco *et al.*, 2005, 2006) and
- short-term (<10 yrs) scale (Jacquemyn *et al.*, 2003; Marriott *et al.*, 2002).

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Available online at [www.sciencedirect.com](http://www.sciencedirect.com)  
ScienceDirect

Journal for Nature Conservation  
[www.elsevier.de/jnc](http://www.elsevier.de/jnc)

Farris E., Filigheddu R., Deiana P., Farris G.A., Garau G., 2010. **Short-term effects on sheep pastureland due to grazing abandonment in a Western Mediterranean island ecosystem: a multidisciplinary approach.** *Journal for Nature Conservation* 18: 258-267.

We aimed to highlight the consequences of abandonment on:

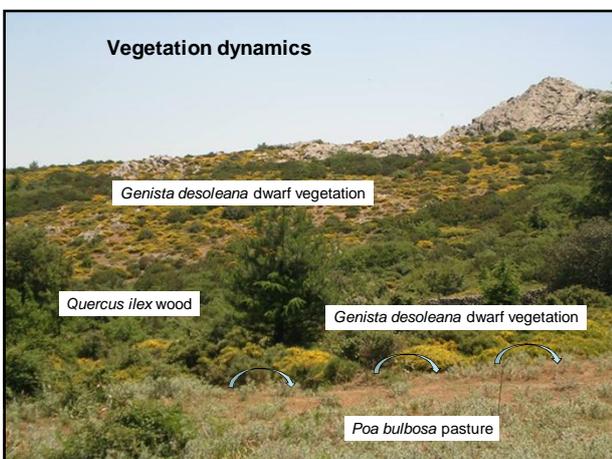
- 1) plant community composition (species number, individual density, life-forms and distribution categories ratio, and community height) and  $\alpha$ -diversity,
- 2) soil fertility,
- 3) composition of microbial community

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**Study site**

Average of 0.41 sheep ha<sup>-1</sup> in 1990 - 2007.

A decrease of 83 %, from 0.77 sheep ha<sup>-1</sup> (1990) to 0.13 sheep ha<sup>-1</sup> (2007).



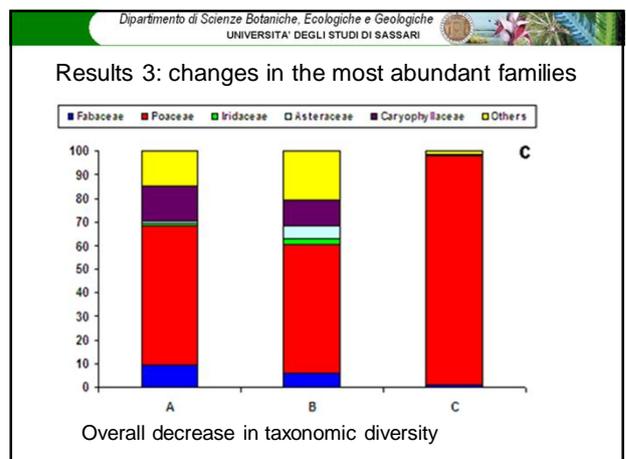
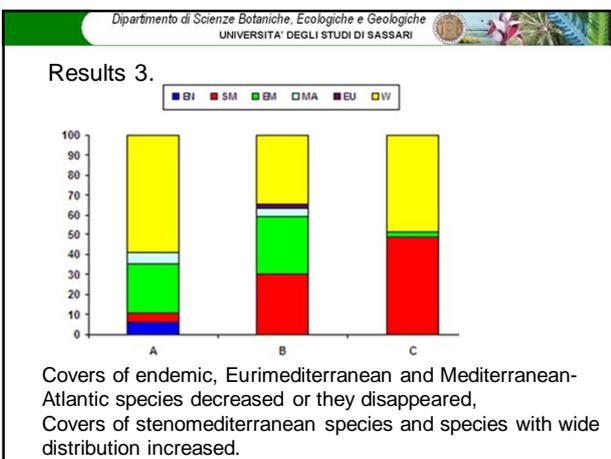
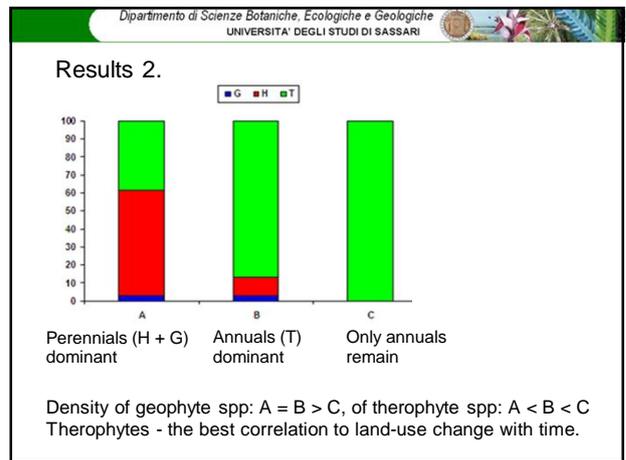
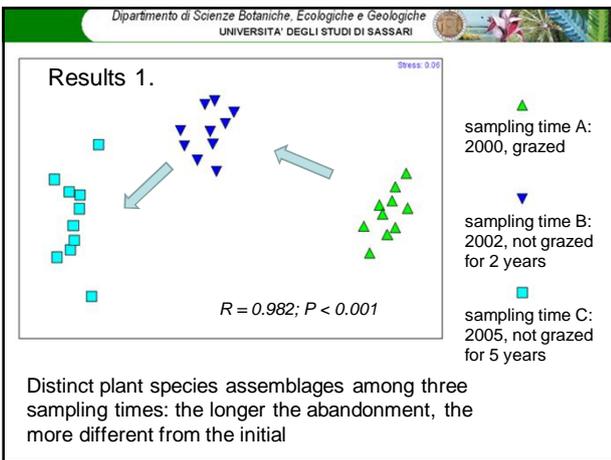
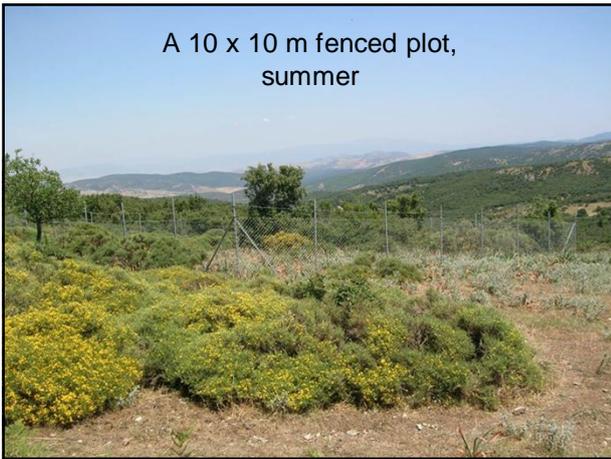
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**Experiment**

- in July 2000, grazing excluded
- during 2000 – 2005, 10 fenced 10 x 10 m randomly located permanent plots grazed on average by 0.23 sheep ha<sup>-1</sup>

Monitoring:

- June 2000, before the fencing (sampling time A),
- June 2002 (sampling time B),
- July 2005 (sampling time C).



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### With grazing abandonment:

- Individual species density increased (min at B),
- Species density and  $\alpha$ -diversity decreased from A to C, reaching max at B,
- Vegetation height increased constantly,
- Soil pH progressively increased,
- Organic matter decreased,
- Nitrogen decreased from A to C, reaching max at B,
- The number of ammonia-oxidizing bacteria was low at all the sampling times, but increased
- The population size of cellulolytic microorganisms was similar at B and C ( $\sim 1.5 \cdot 10^3$  MPN g<sup>-1</sup> soil) and was at min at A.

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### Lessons learnt

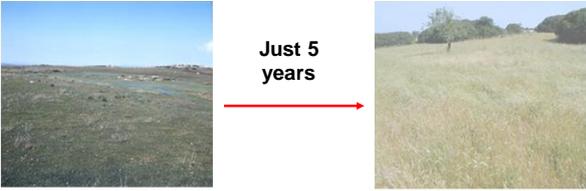
- 1) Livestock has a key role in maintaining the EU priority habitat 6220\*.
- 2) The changes in the structure and the composition of pastureland communities can occur within a few years of abandonment.

Implications

- 1) Monitoring and maintaining of the pastoral management should be performed also at short terms.

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### Studying, monitoring and managing at adequate time scales



Just 5 years

Habitat 6220\*      No Directive habitat ☹

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### Management, conservation and restoration

- Habitats, landscape → Secondary succession routes
- Species → Acting on socio-ecological systems
- Species → Acting on specific needs

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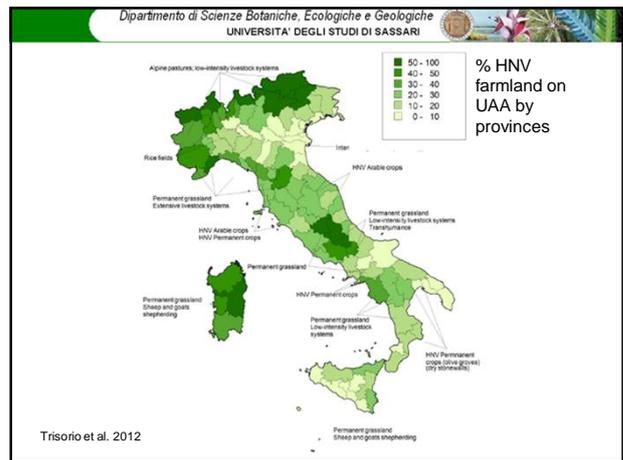
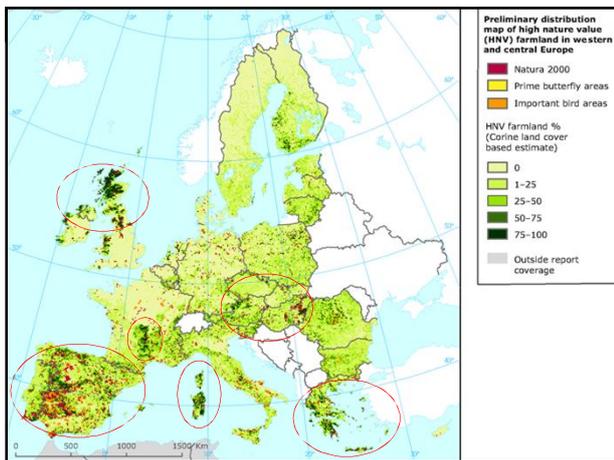
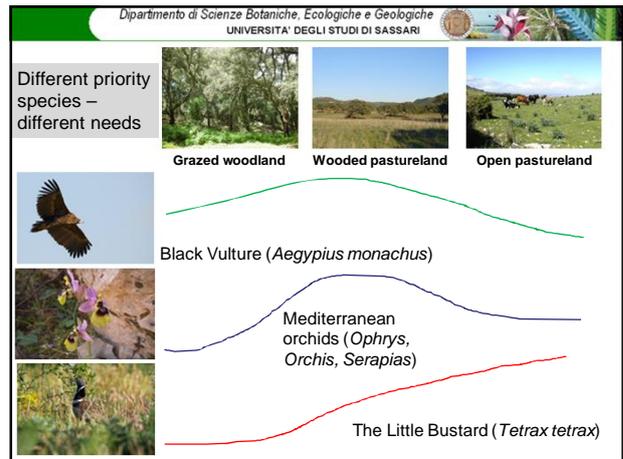
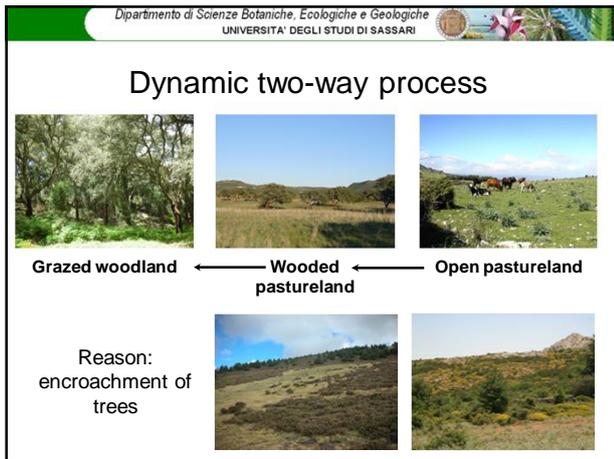
### Dynamic two-way process



Grazed woodland → Wooded pastureland → Open pastureland

Reason: tree dye-off and lack of recruitment





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### The Impact of Land Abandonment in the Mediterranean Basin

- Meta-Analysis (154 cases from 51 studies)
- Abandonment slightly increased plant and animal species richness and abundance overall but...
- results vary between taxa, spatial-temporal scales, land uses, landforms, and climate.
- There is no “one-size-fits-all” conservation approach; conservation policies should strive to increase awareness of the heterogeneity and the potential trade-offs after abandonment.

Plieninger, T. et al. (2014) PLOS; <https://doi.org/10.1371/journal.pone.0098355>