The dehesa agroforestry system in the Iberian Peninsula

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Notes for instructors and users

Juan M. Domingo-Santos & Reyes Alejano (University of Huelva, Spain) 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.hnvlink.eu.

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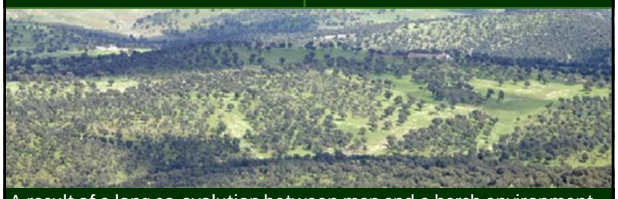
Content

- What is Dehesa?
- Products obtained from the dehesa
- Services provided by the dehesa
- Reasons for dehesas' existence and maintenance
- Current threats
- Conservation values
- Management recommendations

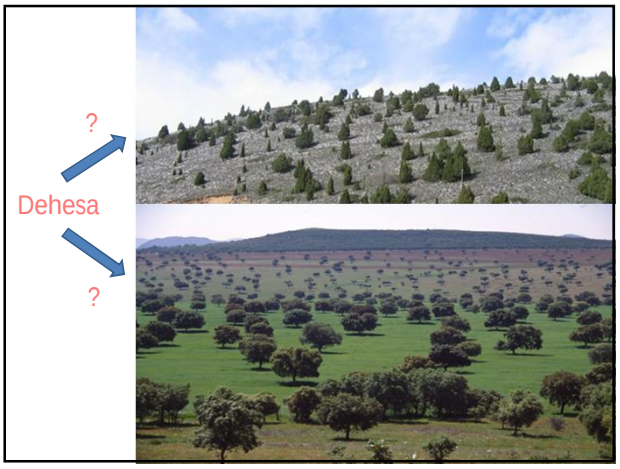
The Spanish dehesa is a woodland agroecosystem created and maintained by humans and their livestock.
It is a traditional Mediterranean silvopastoral system combing production and nature conservation

Main features:

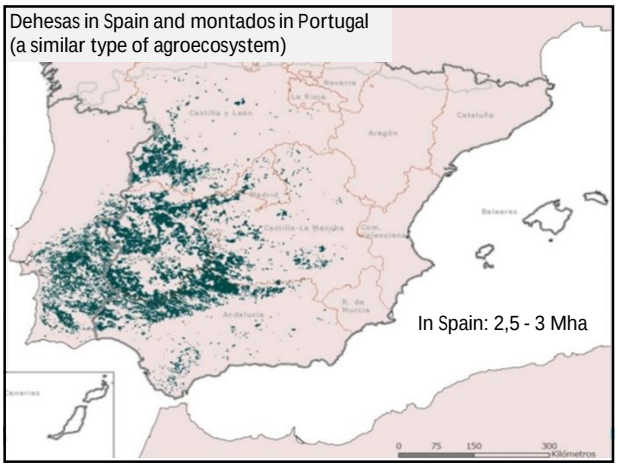
- Mediterranean climate
- Soils of low fertility
- Flat to undulating topography
- Pastures - main production
- Tree cover 5-75%
- Complex secondary production



A result of a long co-evolution between man and a harsh environment. It uses a strategy of efficiency and diversification of structures and products for taking an advantage of every natural resource with a minimum input of energy and materials (San Miguel, 2007)



Dehesas in Spain and montados in Portugal
(a similar type of agroecosystem)



Dehesas provide:

- Products
- Services and functions

Products

Tree productions
- Acorns
- Cork
- Fuel wood and biomass
- Others

Tree species:
Quercus suber (Cork oak)

Quercus ilex ssp ballota (Holm oak)

Other trees:
Quercus pyrenaica
Pinus pinea (Stone pine)
Fraxinus excelsior (European ash)

Products

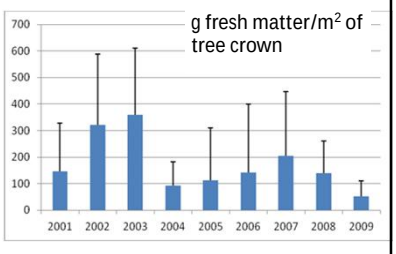
Tree products:
- Acorns
- Cork
- Fuel wood and biomass
- Others

Quercus ilex: Oct-Nov
Quercus suber: Nov-Jan

Acorns are the most nutritionally valuable food resource for a number of mammals, birds and insects, including game and non-game wild species (Greenberg, 2000)

Products

Tree products:
- Acorns
- Cork
- Fuel wood and biomass
- Others



Quercus ilex: Oct-Nov
Quercus suber: Nov-Jan

Acorns - high variability over sites, years, individual trees

Products

Tree products:
- Acorns
- Cork
- Fuel wood and biomass
- Others

Iberian "black leg" pigs' quality of meat and its market value depend on acorn consumption (Alejano et al., 2011).

Products

Tree products:
- Acorns
- Cork
- Fuel wood and biomass
- Others

Cork oak ➔ cork stoppers
Collected every 9-10 yrs.
Sustainable and profitable

Products

Tree production
- Acorns
- Cork
- Fuel wood and biomass
- Others

Traditional operation to obtain fuel wood
Low benefit
Supposed to increase acorn production

Products

Tree production
- Acorns
- Cork
- Fuel wood and biomass
- Other from trees
  - Leaves
  - Lichen
  - Honey

Products

Production not related to trees:
- Grass (shrubs) ➔ pasture
- Mushrooms
- Crops
- Other: livestock, game

Three types of pastures with different composition and productivity

Products

Non-tree production:
- Grass (shrubs) ➔ pasture
- Mushrooms
- Crops
- Other: Livestock, Wildlife (incl. game)

Cistus ladanifer

Amanita ponderosa

Some shrubs important for mushroom production

Products

Non-tree production:
- Grass (shrubs) ➔ pasture
- Mushrooms
- Crops
- Other: Livestock, Game

Crops (only better soils)
rotation: 1 yr crop & 3 yr fallow

Sale of hunting rights (for wild boar, red deer) is an important income source

Dehesas provide:

- Products
- Services and functions

Trees & grassland

- Shade
- Soil protection
- Landscape quality
- Carbon fixation
- Biodiversity
- Genetic diversity

Man-made traditional elements

- Fences
- Farms - buildings
- Livestock infrastructure

High recreational value

Why have dehesas been preserved?

Poor soil quality

- Shallow
- Stony
- Low fertility

-> Unsuitable for more specialised and intensive land use

Why have dehesas been preserved?

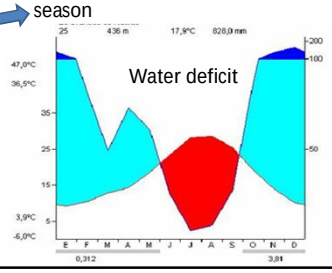
Poor soil quality

Most grass species die in summer. Only tree leaves available as feed

Mediterranean climate

- Hot & dry summer
- Mild rainy autumn and spring
- Rainy (not so cold) winter

Pasture yield is uneven during wet season



Why have dehesas been preserved?

Poor soil quality

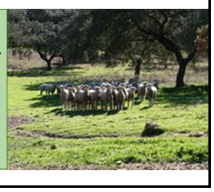
Mediterranean climate

Adaptations

Medium quality rangeland

- Extensive production of locally adapted breeds of livestock
- Hunting areas
- Transhumance (livestock migration)
  - South ⇔ North
  - Plains ⇔ Mountains

Dehesa = a centuries-old, economic solution adapted for a poor environment



Are dehesas REALLY preserved?

1980

2010

Are dehesas REALLY preserved?

Some dehesas have persisted since the Middle Ages

Many dehesas have been created in the last 150 yrs.

Many dehesas have transformed to:

- Rangeland (no trees)
- Shrubland➔ eroded stony soil
- Farmland➔ modern farming (better soil areas)
- Forest restoration or production➔ those evolving previously to shrubland, protected areas and other low profit areas

Are dehesas REALLY preserved?

Pasture degradation
No tree regeneration
Soil compaction

Main threats

Overgrazing:
- Livestock stays continuously (even with supplementary feed)
- Too heavy grazing (even with rotations)

Undergrazing➔ shrubs
Loss of traditional breeds

Are dehesas REALLY preserved?

Pasture degradation
No tree regeneration
Soil compaction

Main threats

Tree decay:
- Climate change
- Disease *Phytophthora cambivora*
- Pest *Cerambycidae*

Degradation
- Soil erosion
- Loss of traditional buildings
- Loss of tree density
- Landscape devaluation

No private resources to reverse situation

Dehesas as protected areas

Habitat Directive 92/43/EEC

Dehesas: man-made ecosystem considered as "Special interest habitat"

United Nations Educational, Scientific and Cultural Organization

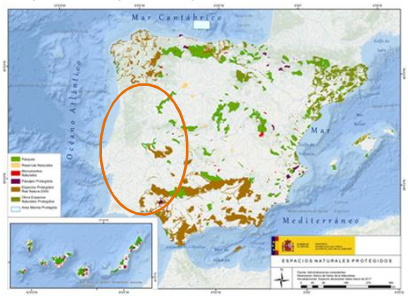
MaB Man and the Biosphere Programme

ESPAÑA SPAINES ISCULTURA CULTURE

Dehesas as protected areas

In Spain:
30% of land protected
Many protected areas contain dehesas
Regional governments promote special regulations

BUT the mainstream agricultural policy supports mainly intensive specialised production, not multifunctional systems



Dehesas as protected areas

A great number of plant species: 30% of the vascular plant species of the Iberian peninsula. Rare animals: Iberian lynx, black stork, otter, dormouse.
Birds of prey: Cinereous vulture, Spanish imperial eagle, short-toed eagle, sparrowhawk, peregrine falcon.

Management and conservation of dehesas

1. Acknowledge social and ecological services➔ increase public funding

2. Recover tree densities
- Better livestock control and management
- Natural or artificial regeneration
- Leave natural forested and shrub areas
- Re-establish transhumance of livestock

Management and conservation of dehesas

1. Acknowledge social and ecological services➔ increase public funding
2. Recover tree densities

3. Research on pest and diseases
- Plants resisting fungus
- Knowledge of disease mechanisms
- Improved management

Management and conservation of dehesas

1. Acknowledge social and ecological services➔ increase public funding
2. Recover tree densities
3. Research on pest and diseases

Local breeds

4. Increase value of products
5. Protect against fire, erosion
6. Protect landscape
7. Protect biodiversity

Improve sustainability

Sources:

Alejano, R., Vázquez-Piqué, F.J., Domingo-Santos J.M., Fernández Martínez, M., Andivia-Muñoz, E., Martín Pérez, D., Pérez-Carral, C., González Pérez, M.A. 2013. Dehesas: Open woodland forests of Quercus in Southwestern Spain. In Chuteira, C.A. y Grao, A.B. (Eds.), Oak: Ecology, types and management. Nova Science Publishers; Hauppauge, New York. pp.87-117.

Fra. Paleo, Urbano. (2010). "The dehesa/montado landscape". pp. 149–151 in Sustainable Use of Biological Diversity in Socio-ecological Production Landscapes, eds. Bélair, C., Ichikawa, K., Wong, B.Y.L. and Mulongoy, K.J. Montreal: Secretariat of the Convention on Biological Diversity. Technical Series no. 52. Available https://www.cbd.int/doc/publications/cbd-ts-52-en.pdf

Eichhorn, M. P., Paris, P. Herzog, F., Incoll, L. D., Liagre F., Mantzanas, K., Mayus, M., Moreno, G., Papanastasis, V. P., Pilbeam, D. J., Pisanelli, A., Dupraz, C. 2006. Silvoarable Systems in Europe – Past, Present and Future Prospects. Agroforestry Systems 67, 29–50.

Agforward. 2016. System report: Dehesa Iberian, Spain. Available et https://www.agforward.eu