THE SPANISH DEHESA
A traditional Mediterranean silvopastoral system
linking production and nature conservation


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INTRODUCTION

STRUCTURE AND MANAGEMENT
• The tree layer
• Natural pastures
• Crops, including sown pastures
• Livestock
• Hunting species

ENVIRONMENTAL QUALITY
**DEHESA**

**Etymology:** `deffesa` grazing land reserved for cattle used for land ploughing

**Current meaning:** pastoral-silvo-agricultural system developed on poor or non-agricultural land and aimed at extensive livestock raising

**Origin:** Middle Age
Neolithic? (yr 924)

- Reconquest of Iberian Peninsula from Moors
- Re-distribution of recovered land
- Re-population of recovered land

- Mesta
- Separation of heritages

- Sale of Church and nobility lands
The dehesa, as every other traditional agroforestry system, is the result of the co-evolution of man and that difficult natural environment: it uses a strategy of efficiency and diversification of structures with the aim of taking advantage of every natural resource with a minimum input of energy and materials.

Major features:

- **Mediterranean climate:** summer withering herbaceous pastures, perennial trees and shrubs, fruits (acorns)
- **Poor soils:** eventual cropping
- **Flat or hilly topography:** soil variation with slope, nutrient and water cycles
The dehesa system has persisted for millennia, and exists today, because of its versatility (diversity); because it has been, and it is now, the most efficient system to satisfy the changing demands of the human society within that difficult natural environment.
DISTRIBUTION

AREA: 3.5 – 4 million ha
The dehesa is a human-made system: a more efficient one than a forest in satisfying human demands, but an unstable one, because its persistence relies upon its own management. That is why that management is also a powerful conservation tool.
The link between the high structural and biological diversity of the dehesa and its efficiency and stability is the high diversity of relationships between its components. They are so closely entangled by that net of inter-relationships that the management of every single component necessarily affects each of the others.
THE TREE LAYER

- General stability
- Temperature
- Humidity
- Nutrient cycles
- Soil
- Physical protection
- Wind
- Landscape
- Competence with herb layer
- Fodder
- Fuel wood, charcoal
- Cork
- Fungus

*If trees were not essential in the dehesa system, they would have disappeared long time ago*
Typical Spanish Dehesa
Perennial Tree Species
(Permanent fodder bank)
(Fruit crop is essential)

Holm oak, cork oak, other species

(15) 20 – 100 (200) trees/ha
Basal area: 2 – 10 (15) m²/ha

- Acorns
- Fuelwood
- Charcoal
- Browse
- Cork
- Edible fungi

Quercus rotundifolia

Quercus suber
Browsing can be done either on prunned branches or directly on trees and shrubs.
REGENERATION OF THE TREE LAYER

Natural regeneration of the tree layer is usually easy at early stages, but nowadays seedling mortality is almost complete due to the current pastoral use.

TODAY, THE LACK OF REGENERATION OF THE TREE LAYER IS THE MOST IMPORTANT PROBLEM FOR SPANISH DEHESAS

Regeneration of high forest dehesas is more difficult than that of coppices, due to the large root systems of the latter.
The sudden death of trees, known as `seca´ accelerates the decrease of the tree density, thus increasing the importance of the lack of natural regeneration.
Reforestation (densification), with the complement of protection structures against livestock or wildlife, is a suitable way to guarantee the future of the Spanish dehesa.
NATURAL PASTURES

- Fodder (seasonal)
- Dynamism
- Healing tissue

- Spatial heterogeneity
  - Phytosociological types
  - Below and out of crown cover

- Temporal heterogeneity

- Diversity (plants and seeds)

- Legumes (*Fabaceae*) are essential
Three basic guidelines for pasture management at the dehesa system

**GRAZING**
- Intense, continuous, deferred
- Selection of valuable species
- Intense nutrient recycling

**LEGUMES**
- Main source of protein
- Acceptable quality after flowering
- Attractive for livestock

**PHOSPHORUS**
- Essential for legumes
- Small annual inputs

**Graph**
- Fresh fodder yield
- 1000 – 2700 kg/ha-yr (DM)
- High inter-annual variability
- Low level of net protein, if legumes are scarce
- 15-25%
- 5-15%
- 60-70%
- Bad year
- Good year

**Seasons**
- S: Summer
- O: Autumn
- N: Winter
- D: Spring
CROPS, INCLUDING SOWN PASTURES

The dehesa is not an agricultural system

- Source of food
  - for humans
  - for livestock and wildlife
- Complement to natural pastures
  (seasonal distribution and quality)
- Control of woody vegetation
- Carried out eventually
Agricultural crop

Fallow

Posío (annual grassland)

Stubble

Several years

Oat – barley crop (3-4 year/cycle) on a dehesa of central Spain
*Trifolium subterraneum* sown pasture, grazed by red deer (*Cervus elaphus*), in a cold dehesa, 6 years after establishment. Montes de Toledo, central Spain.
LIVESTOCK

- Major final product of the system
- Main tool for creating and improving grass swards (*grazing optimization*)
- Tool for controlling woody vegetation
- Transporter of fertility (nutrients)
- Disperser of species (zoochory)
- Accelerator of nutrient cycles
- Manager of species diversity

_Efficient extensive system: low production, low cost, high quality, environmentally sound_
Sheep is the most suitable livestock species for the dehesa system: it is a good walker and a selective grazer, able to feed on short grasses. The emblematic breed is the merino sheep, once an exceedingly appreciated resource for its high quality wool. Today, it provides lambs (milk for traditional cheese). There are also improved breeds: merino precoz, Fleischschaf, Landschaf, Ille de France,...
Sheep raising systems at the dehesa

Extensive (less or no supplementary feeding)

Intensive (not in stocking rates) (more supplementary feeding)

Ewe nutritional requirements

1 lambing season/year (spring or autumn)

Stocking rate: 2 - 4 ind/ha

3 lambing season/2 years
Retinta

Autochthonous cattle breeds were used as labor animals. Today, they are used for extensive meat production, since they do not need shepherds. However, supplementary feeding is necessary.

Cattle is an opportunist feeder and may browse with intensity, even young trees.

Morucha

Avileña negra ibérica
Cattle raising system at the dehesa

Stocking rate: 0.2 – 0.4 ind/ha

Data from C. López-Carrasco (Dehesón del Encinar)
Iberian pig (industrial cross with Duroc Jersey) is the most suitable breed. During the final part of its life, the acorn-fall season (October-January), it feeds on acorns and grass to produce a top-quality meat. Therefore, during that season it must have priority for feeding on acorns over every other livestock species.

**Stocking rate:**
0.4 – 0.6 ind/ha

Metal ring aimed at avoiding damages on the soil.
OTHER LIVESTOCK SPECIES

- Spanish Goat
- Cachemir Goat
- Donkey
- Spanish horse
HUNTING SPECIES

Rabbit

Wild Boar

Red legged partridge

Wood pigeon

Red deer
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<th>ENVIROMENTAL QUALITY</th>
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<td>• The dehesa is not a mere productive system. It is also a highly diverse and valuable ecosystem.</td>
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<td>• The dehesa provides a wide variety of services, or environmental benefits: stability, landscape, tourism, cultural heritage,...</td>
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<td>• The dehesa is the habitat of many endangered plant and animal species and communities.</td>
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<td>• That is why the dehesa has been included, as a protected habitat, in the 92/43/EEC Habitat Directive, and therefore in the Nature 2000 network</td>
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<td>• Traditional (extensive, integrated, efficient) management is not just a tool for producing resources. It is also (and more and more each day) a powerful conservation tool</td>
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<td>• Special care must be taken with soil, as it is the less renewable resource of the ecosystem, and crown coverage</td>
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ENDANGERED ANIMAL SPECIES

Iberian Imperial eagle

Iberian Lynx

Cabrera’s vole

Black vulture

Crane

Black stork