

Origin and Management of the *DEHESA* (Evergreen Oak) (*Quercus rotundifolia* Lam.) Woodlands of the Southwestern Iberian Peninsula

Enrique Balbuena-Gutierrez
Forestry Production
Investigation Agraria Services
P.O. Box 22, Badahoz 06080, Spain

What is the "DEHESA"?

The *Dehesa* is a good example of a manmade ecosystem with a high level of sustainability and stability in terms of ecological products. *Dehesa* ("Montado" in Portuguese) is the Spanish word used to describe the open forests and woodlands of *Quercus* species that can be found in the Southwestern Iberian Peninsula, a savannah-like landscape. These lands are also good grazing lands and are usually divided into plots enclosed by stone walls or wire fences to permit the management of the livestock.

The main characteristics of the *Dehesa* are the following:

- It has many uses and needs good management because it has multiple products including those derived from the trees and those derived from the pasture.
- One of the principal products - the livestock - is also a tool that is used to improve and transform the ecosystem. By making good use of the livestock, the perpetuation of the *Dehesa* system can be promoted.

There are different layers of vegetation in the *Dehesa*:

- The tree canopy layer is mainly formed by *Quercus rotundifolia* Lam., with high presence of *Quercus suber* L. in the more sandy soils, *Quercus pyrenaica* Willd. (mountain areas), *Quercus coccifera* L. (as shrubs), *Quercus lusitanica* Lam. (as shrubs,) and occasionally, *Quercus faginea* Lam.
- The grassland layer is formed by species of the genus of the family *Leguminosae*; *Trifolium*, *Medicago*, *Lotus*, *Anhyllis*, *Vicia*, *Lathyrus*, *Onobrychis*, *Hipopocrepis*, *Astragalus*, *Scorpiurus*, etc., and genera of the family *Poaceae* such as *Lolium*, *Dactylis*, *Poa*, *Festuca*, *Agrostis*, *Bromus* etc. Trees are generally widely spaced with a density of 40 - 60 per ha. Since trees live for hundreds of years, replacement is infrequent.
- The grassland has a very high turnover rate because the pasture is formed mainly by annual grasses that live and grow during the autumn-winter-spring period and die at the end of spring during the hot and dry summers (that last around four months); these plants survive as seeds to start growing again the next autumn.

Why does the *Dehesa* exist?

The word "*dehesa*" comes from the Latin word "*deffesa*"; it was the name given to an area enclosed and protected from being grazed by wild animals and was reserved for livestock to rest and feed. These lands have been inhabited by human and human societies for thousands of years.

Early societies had to provide their food and clothing needs with the resources that the poor acid soils of these Mediterranean climates supplied. These zones have a typical Mediterranean climate with long hot-dry summers and cold winters, with a very irregular distribution of rain, and frequent drought periods. Because of the poor soils and the Mediterranean climate, resources were always scarce, diverse, and variable from season-to-season and year-to-year. Little land in these areas was suitable for agriculture, so most land was used for stockbreeding. A special feature was that some oaks (40-60 trees/per ha.) were left in these pastures.



Fig. 1. Edie Sternberg in *Quercus rotundifolia* Dehesa.

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Why were the evergreen oaks and some other oaks left in this good grazing land?

Since olden times, people living on these lands noticed that *Quercus rotundifolia* Lam. trees, "encinas" in Spanish or "azinheiras" in Portuguese, produced sweet acorns. These acorns were highly valued as food - both for humans and for livestock. Men sometimes ate them directly, or dried and crushed them into acorn flour. Acorns were also fed directly to domestic livestock, including sheep, goats and the native Iberian black pigs. Feeding acorns to the pigs resulted in very high quality pork, which is very expensive today.

So for hundreds of years the inhabitants of these lands selected the best trees — the ones with sweetest acorns, the best branch structure, and those that occupied the most favourable sites. These trees were mainly evergreen and cork oaks and were left scattered in the pastures. Although leaving some trees meant that livestock had less area for grazing, there were many advantages, including a more natural ecosystem.

The ancestors of the current Spanish and Portuguese landowners also appreciated other advantages by leaving the oak trees in these areas, including:



Fig. 2. *Quercus rotundifolia* foliage and acorns.

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- There was a microclimate under the crowns of the trees, resulting in warmer temperatures in winter and cooler, fresher conditions during the summer.
- The trees helped protect the undeveloped soils from erosion.
- The trees provided shade to livestock during the hot summers.
- The trees slowed down the winds and helped prevent the pastures and soils from drying rapidly after rains.
- By leaving the trees, a greater variety of products could be produced from these areas, such as firewood for heating and cooking, good quality charcoal, and cork (where cork-oaks (*Quercus suber* L.) grew).
- Leafy branches could be used to feed livestock in very dry years; special products such as edible mushrooms that grow under the trees could be harvested; and the habitat for wild animals that lived in the *Dehesa* (deer, wild boars, rabbits, hares, etc.) could be enhanced.

How was the *Dehesa* created?

To create a *Dehesa* the forest first has to be cleared and the pastureland must be stabilised. To clear the forest, fire was used extensively in ancient times to remove shrubs and keep them from growing back. Today the undergrowth is cleared using caterpillar tractors with plows that eliminate the shrubs. Since the pastures in these zones are not permanent vegetation communities (they aren't climax vegetation), shrubs (mostly *Cistaceae*) quickly invade them if they are abandoned. The pastures must be stabilised by continuous grazing and by plowing and cultivating from time to time, each four or five to fifteen years, until the shrubs are controlled.

Below is the traditional cycle used for stabilisation;

ORIGINAL FOREST > CLEARING THE FOREST > FALLOW LAND > PLOWING > SOW CEREAL & LEGUMES > GRAZE LIVESTOCK ON STUBBLE FIELDS > GRAZE LIVESTOCK ON UNSTABLE PASTURE LAND FOR 3 TO 15 YEARS > STABILISED PASTURELAND

This cycle lasts from five to fifteen years and has to be repeated many times until there is good, stable grasslands with species of grasses of good quality for feeding livestock. Once stabilized, however, there is no need for further plowing and sowing because shrubs can be controlled through grazing. If the *Dehesa* is abandoned, shrubs will invade and weeds will replace the high quality forage previously selected by the animals.

How do we manage a *Dehesa*?

As we have already said, livestock are both the main product of the *Dehesa* and the primary tool for creating the *Dehesa* and controlling the invasion of shrubs. Therefore it is necessary to always have livestock grazing the *Dehesa* at the appropriate density.

Today there are enough livestock in the *Dehesa* during the whole year to maintain it as pasture. But there are some problems with this. In first place, during the drought period in the summer, there is almost no forage in the *Dehesa*, so the animals have to be fed supplements. In the second place, with so many animals grazing throughout the year, there are problems with the natural regeneration of oaks, because the soils have become compacted and saplings are eaten because there is no other food in summer.

In the past this problem didn't exist because there were not as many livestock in the *Dehesa*; there were no cows and generally only Iberian black pigs and sheep were bred up. The sheep were moved to summer pastures in the mountains during the summer ("*trashumancia*" is the Spanish name for this traditional custom) and the pigs could survive well in the summer, even when little food was available. The season and duration of grazing depended on the management approach of the landowner and usually the livestock rotated from one plot to another to use all the pastures most efficiently.

Today, however, sheep (mainly "*merina*" breed; 1-3 sheep/ha.) are kept in the pastures all year long, and are bred for meat (lambs), and produce milk for cheese, and wool. Spanish bulls and cows of high rusticity ("*avileña*", "*retinta*" breeds; 0.25 cows/ha.) are also bred for meat. They all have to be fed supplements during the summers.



Fig. 3. An ancient *Quercus rotundifolia* frames a horse in a Spanish *Dehesa*.

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During the time of acorns (from October to February), Iberian black pigs are fattened (0.5-1 pigs/ha.) on the acorns throughout the *Dehesa*. This is the period known as "*montanera*," during which time the pigs double their weight in only a few months by eating acorns, grasses, mushrooms, etc. They grow from around 80 kg. at one year of age at the start of *montanera*, to around 160 kg. Four months later, they are slaughtered. Until they are one year old to start the *montanera*, the little pigs are raised in intensive farming, in special plots and pigsties where they are looked after and fed with mixed feed.

The *Dehesas* are also the feeding zones of many wild animals, some of which have high economic value because they are valuable game species. These include deer, wild boars, hares, rabbits, etc., which people pay considerable sums to hunt.

In the *Dehesas* where cork oaks grow, the bark of these trees is removed every nine or ten years during the summer (July-August) and sold at high prices (actually around \$50 per tree).

Grazing appears to be the most important factor contributing to stabilizing the *Dehesa* when done in a correct, sustainable manner. But it can also contribute to poor oak regeneration when too many animals are kept on the land. In some cases, artificial tree regeneration may be necessary. These new trees should be protected from livestock with tree shelters, or the plots where they are planted should be removed from grazing for several years. Conservation of the *Dehesa* ecosystem may require management techniques that reduce animal numbers and call for careful timing of the season, rotation and duration of grazing in each different pasture.