



## **SCIENTIFIC RESEARCH SHOWING THE EFFICIENT PRODUCTIVITY OF WOOD PASTURES WITH A HIGH DENSITY OF TREES AND SHRUBS**

Rivest et al (2013) report that considerable efforts have been invested globally in studying the processes underlying both positive and negative effects of trees on pasture yield. They found that positive tree canopy effects may involve, for example, microclimatic amelioration through moderate shading (ca. 50% of full sunlight) that may lower soil and air temperatures, reduce pasture evaporative demand and water stress, and enhance plant water-use efficiency. Tree canopies may also improve soil properties, especially nutrient availability, i.e. the so-called “islands of fertility”, a key pathway through which the nutritional quality of herbaceous understorey may be improved for livestock. Negative tree canopy effects include excessive interception of light and precipitation. Positive below-ground tree effects may involve hydraulic lift and increased water infiltration rates. Negative below-ground tree effects mainly involve competition for water. Given that one of the outstanding positive effects of trees is the increase of soil fertility, one could expect an enhanced positive effect of trees on pasture yield in less fertile soils.

The two examples of scientific research summarised below illustrate clearly the productive value of Spanish dehesa wood pastures with a high density of trees and shrubs, including up to 100% tree canopy. These systems are often more productive than pastures with no trees or shrubs. The trees and shrubs make a positive contribution to the forage system, so that applying pro-rata reductions in CAP support because of their presence even at high densities would make no agronomic sense, and even less environmental sense. Note that the dehesa is only one type of wood pasture, there are many others in Spain including systems with much higher numbers of trees per hectare.

Hernández Díaz-Ambrona et al (2008) analysed the productivity of dehesas in Extremadura according to tree density. Of the 1 million hectares of dehesas in the region, they find 370,000ha have 40-100% tree canopy and 460,000ha have a canopy of 20-39%. The research found that the highest carrying capacity for cattle is in the category with 20-70% canopy and for extensive pigs it is the 40-100% canopy category. Even up to 100% tree canopy these dehesas are fully active and functioning farming systems (and of High Nature Value). The study helps to show how it is scientifically wrong to see trees as something that hinders farming, in these systems they are just as important to the production system as the grass.

López-Díaz et al (pending publication) found that pasture partially covered by trees and/or retama shrubs (*Retama sphaerocarpa*) were more productive than plots with no trees or shrubs. Among woody components, *Quercus ilex* trees elicited the most positive effect for Metabolizable Energy (ME) of the dehesas because the provision of acorn and palatable leaves and the reduced negative effect for pasture understorey growth. The effect of retama shrub cover was also positive for the whole production of ME because a slight increase of pasture production (2.86% in terms of ME) and the contribution of retama fruit. In addition retama did not affect significantly the acorn production when trees were present. According to our results, ME production is optimized with around 70% tree cover and 60% of retama cover. Under this structure, trees provide 41% of the total ME (19% by acorns plus 22 % by leaves), retama provided 1% and pasture 58% of the total ME.

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The results of this research showed that wood pastures were more productive than open pastures and that shrub can play a positive role for forage production of Iberian dehesas, either facilitating the production of herbaceous pasture and/or providing palatable resources as young sprouts and/or fruit. In the case of both retama and cistus shrubs, plots with certain level of shrub cover were more productive than shrub-free plots, although the use by livestock could be limited at high shrub covers. It is also important to bear in mind other potential positive effects of trees and shrubs for provision of ecosystem services as C sequestration and biodiversity. The positive role of cistus and retama as promoter of natural regeneration of *Quercus ilex* in Iberian dehesas is also noticeable. The authors recommend that good management practices of Iberian dehesas and similar extensive silvopastoral systems should maintain the shrub layer (at optimal densities) to take advantage of the multiple positive roles of shrubs for ecosystem functioning without compromising overall productivity of the system.

Hernández Díaz-Ambrona C., Etienne A. and Martínez Valderrama J. 2008. Producciones potenciales de herbáceas, de bellota y carga ganadera en las dehesas de Extremadura. In PASTOS, XXXVIII (2), 243 – 258.

López-Díaz M.L., Rolo V., Benítez R. and Moreno G. (pending publication). SHRUB ENCROACHMENT OF IBERIAN DEHESAS: IMPLICATIONS ON WHOLE FORAGE PRODUCTIVITY. Submitted to Agroforestry Systems journal.

Rivest D., Paquette A., Moreno G. and Messier C. 2013. A meta-analysis reveals mostly neutral influence of scattered trees on pasture yield along with some contrasted effects depending on functional groups and rainfall conditions. Agriculture, Ecosystems and Environment 165 (2013) 74– 79



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