

Tree regeneration in grazed wood pastures

How to assist natural
regeneration?

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Why do we need to support tree regeneration?

Dehesas and Montados are very suitable for pasture production. However, livestock grazing hampers the natural regeneration of the tree layer, especially in areas with challenging soil and climate conditions. Seed predation by domestic and wild animals, abiotic stresses (drought, high summer temperatures and infertile soils), and the lack of suitable microsites for seed germination are major impediments to seedling establishment and survival.

The maintenance of Iberian dehesas and montados depends on the sufficient regeneration of the trees. In many areas, however, natural regeneration does not compensate the loss of trees and the tree population is too old. To safeguard the sustainability of these pastures, it is necessary to take steps to actively support tree regeneration and ensure that sufficient number of young trees are established well before the old ones die.



Iberian wood pastures grazed with low stocking rates and with abundant natural regeneration of oaks. Ref: F. Pulido



View of the young surviving trees a few years after an artificial plantation in an open dehesa stand. Ref: M. Bertomeu

The constraints of current approaches to tree regeneration

The three most common techniques to enhance the tree regeneration of Iberian dehesas and montados are (i) planting young plants (1-2 years old) at high density (400-600 plants/ha) with complete exclusion of grazing for 20 years; (ii) planting and protecting a small number of young trees scattered in very open stands and maintaining grazing; and (iii) simply fencing-off large areas to prevent livestock grazing and waiting for trees to establish naturally.

The first approach entails using nursery grown seedlings, mechanized land preparation, hired labour for planting, and results in a loss of rent by grazing exclusion. The second approach requires sturdy tree shelters to protect against grazers. A standard wire mesh protector has been widely used in subsidized wood pasture tree planting projects. However, the high cost of up to 30 Euros per unit limits its use.

Both these options (fully artificial regeneration) are challenging on a large scale (300-700 Euros/ha for 20 trees/ha) without external financial support. Furthermore, these approaches lack flexibility to adjust to contingencies that compromise project success (e.g. a drought), and frequently the survival of planted seedlings is very low (Moreno and Franco 2013).

For the third approach (natural regeneration by grazing exclusion) tree recruitment is very slow (15 to 25 years), and only small portions of the farm can be regenerated, as farmers cannot afford to have sizable areas of exclusion for so long.



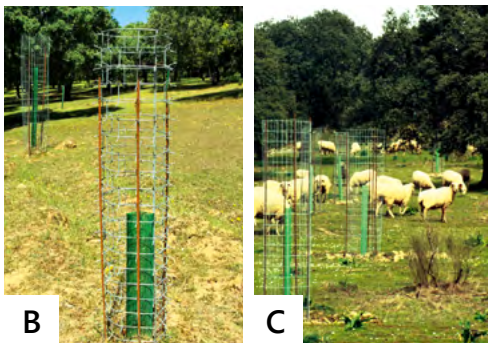
Artificial tree regeneration in grazed wood pastures, by using individual shelters. Ref: M. Bertomeu

Advantages

- In farms grazed by small size livestock (e.g. sheep), the dehesa manager could use natural low-cost protectors created by piling up branches over seedling (5 Euros per unit).
- Artificial thorny shelters ("Cactus type"), 15 Euros per unit could be used for protection from cattle and wild ungulates.
- Wire mesh protectors are the most appropriate method on farms grazed by bullfighting cattle.
- To use shade shelter increases the survival of the seedling, thus it is an appropriate method.



A



B

C

Alternatives types of protectors for oak seedlings: natural protection with piling up branches (A), artificial thorny protector (B) and standard steel mesh protector (C).

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A multi-approach to regenerate trees at low cost

1. Collecting seeds

When? Preferably, acorns should be collected during "masting" years of high production to ensure the selection of large, mature and healthy high quality seeds.

How? To ensure the genetic variability, acorns should be collected within the target stand from around 30 to 50 trees that are at least 100 m apart. Acorns can be stored for a few weeks in moist sand kept in cool conditions.

2. Sowing

Acorns should be sown as soon as possible after seed collection, preferably in late autumn or early winter, planting 2 acorns per hole at 5 cm depth.

3. Creating microenvironments favourable to tree recruitment

3.1. Nurse shrubs

Trees grow and survive better under the canopy of leguminous shrubs, as the microclimate, soil fertility and soil moisture conditions are more favourable than in the open areas. Moreover, these and other thorny/dense shrubs, protect seedlings from browsing (Rolo et al. 2013).

3.2. Creating regeneration microsites

In the absence of shrubs, favourable microsites can be created by piling up fine branches left over from pruning operations. Besides, they can also function as regeneration hotspots by encouraging rodent dispersal by providing shelter for dispersed acorns and seedlings.

4. Preventing acorn predation

Seed germination rates increase if acorns are coated with commercial or home-made repellents. For instance, the removal by mice of sown acorns decreased by 50% when acorns are coated with fresh dog faeces (Pulido et al. 2016).

5. Protecting young tree recruitment

The demand for alternative, cost-effective methods to protect seedlings is increasing. In general these alternatives are aimed at reducing either the cost (e.g. of the material, the protecting devices, and the labour) and/or increasing plant survival in the long term (Cáceres et al. 2017). The use of artificial thorny protectors (<https://protectorcactusworld.com/>) give promising results, reducing costs and lengthening the duration of the protection.

Further information

Cáceres Y, Pulido FJ and Moreno G (2017). Regeneración artificial en dehesas con diferente manejo de ganado: evaluación de la eficiencia y optimización del costo. 7º Congreso Forestal Español, Plasencia, Spain. <http://7cfe.congresoforestal.es/sites/default/files/actas/7CFE01-334.pdf>

Moreno G, Franco S, Castaño ML (2013). Efecto diferencial de la jara (*Cistus ladanifer*) en la supervivencia de plántulas emergidas y plantadas de encina (*Quercus ilex*). 6º Congreso Forestal Español, June 2013, Vitoria, Spain <http://secforestales.org/publicaciones/index.php/congresos/article/viewFile/10451/10355>

Pulido F, Alonso S, Castaño FM, Cáceres and Moreno G (2016). Can rodent acorn dispersal be manipulated to promote tree regeneration? A test using woody debris as shelter for dispersers and seedlings in grazed oak woodlands. World Congress Silvo-Pastoral Systems (Évora, Portugal).

Rolo V, Plieninger T, and Moreno G (2013). Facilitation of holm oak recruitment through two contrasted shrubs species in Mediterranean grazed woodlands. *Journal of Vegetation Science*, 24(2), 344-355.