



Establishing pastures rich in legumes

How to develop a more sustainable dehesa farm

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Why establish biodiverse pastures rich in legumes?

Dehesa is a man-made silvopastoral ecosystem. It is characterised by a high biodiversity, but pasture production can be low, especially in winter and summer. Consequently, many farmers are dependent on external fodder sources, making the dehesa a less economically sustainable ecosystem.

Establishing permanent pastures rich in legumes could result in a substantial positive change for farmers and stock breeders by mitigating seasonal yield differences, and reducing the critical grazing period for cattle. Through sowing commercial varieties which were previously present in the natural pastures, there is minimal risk for native communities. The potential benefits have been demonstrated on seven dehesa-farms in Extremadura, Spain, on parcels that were sown with legumes, at various times, over the last 20 years.



Detail of the biodiverse sown pasture species.
Ref: E. Juárez



View of pasture rich in legumes sown in November 2013 (picture taken in May 2014) in plots grazed by sheep in the dehesa farm in "Atoquedo", located in the National Park of Monfragüe (Torrejón el Rubio, Extremadura, Spain). Ref: G. Moreno

What kind of seed mixture is the most appropriate?

The dehesa is a distinctive ecosystem characterized by a mosaic of shade imposed by scattered *Quercus* spp. trees and shaped by the moderate grazing pressure (<0.5 Livestock Unit ha⁻¹). The biggest challenge to establishing leguminous pastures is the spatial heterogeneity in terms of light, temperature and humidity, which produces two main microhabitats: beneath and beyond the tree canopy. In addition to meeting this challenge, the seed mixture species must have a high self-reseeding capacity, and also be able to establish deep roots to deal with cattle pressure and long dry summers.

Taking all these considerations into account, some species (such as: *Trifolium subterraneum*, *Ornithopus compressus*, *T. michelianum*, *T. striatum* and *T. glomeratum*) seem to be very well-adapted to the dehesa system. These species performed better than the rest of the legumes trialled, were more productive and also more persistent. Consequently, they are considered suitable candidates for mediterranean silvopastoral systems. Seeds were sown at a density of 20 kg/ha, buried around 0.5-1.0 cm. Re-seeding is not usually needed before 20 years.



Sown pasture rich in legumes in the dehesa farm Casablanca (North Cáceres, Spain)
Ref: Ana Hernández

Advantages

- Sown pastures perform well both beneath and beyond the tree canopy.
- Noticeable increase in yield (up to 300% in the first years).
- Improvement of pasture quality (protein content almost doubled) due to the increase in the proportion of legumes.
- Reduced costs as commercial nitrogen fertilization is replaced by rhizobium fixation.
- Enhanced economic and ecological sustainability of the dehesa system.



View of the pasture in winter, comparing a native pasture (right) with a sown pasture rich in legumes (left)
Ref: Ased Agro Company

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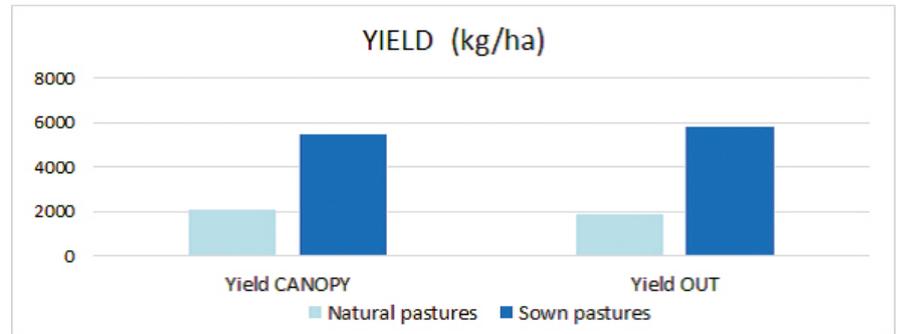
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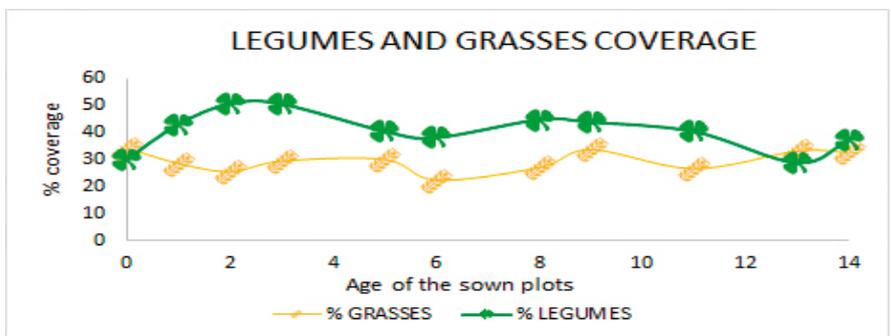
Improving pasture and soil quality

Greater yield is obtained (almost tripling the natural pasture level) and, over time, the coverage of legumes increases significantly. In comparison with the natural pastures, during the first years after the sowing, legumes coverage improved by 66%, stabilizing at an increase of 35% 12 years after initial sowing.



Average yield (kg/ha) beneath and beyond tree canopy in natural and sown pastures

The increase of legumes coverage is accompanied by an increase in nitrogen fixation, thus the need for nitrogen fertilizers is dramatically reduced. In addition, the content of carbon accumulated into the soil shows a positive tendency with age, both under and beyond canopy areas. This underlines the potential of sown legumes as a means to increase the resilience of this silvopastoral systems against the negative effects of climate change.



Evolution of legume and grass coverage over a 14 year period

Further information

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