



# Grazing sheep under walnut trees

Producing high quality timber whilst reducing costs

[www.agforward.eu](http://www.agforward.eu)

## Why introduce livestock?

There is a high demand for hardwood timber, such as hybrid walnut, in the EU. To meet this demand, over the last decade, hardwood plantations have substantially increased production in many Spanish regions. Intensive management is often required to grow these trees in short rotations. Such management comprises irrigation, fertilisation, and chemical weed control. However, this level of management has high economic and environmental costs. Plantation management accounts for more than 45% of the total investment costs. Moreover, these operations can have major environmental impacts, similar to the effects of intensive agriculture systems.

Introducing livestock and sowing legumes can reduce the financial costs of these plantations and optimize their environmental functions. This is known as a silvopastoral system.



Sheep grazing under walnut trees in summer  
Ref: G. Moreno



Pasture under hybrid walnut plantations. Ref: E. Juarez

## Where and how to plant

Hybrid walnut trees need a rather humid climate, preferably with a moderate dry period (about 3 months without rains) and not too cold (annual mean temperature above 10°C). Some hybrid walnut progenies (e.g. Mj-209xRa; *Juglans major x regia*) show a higher tolerance to warm climates, such as in the Mediterranean areas, than local walnut (*Juglans regia*). Although walnut can grow in a wide variety of soil types, it does best in a deep, well-drained soil, with a loamy texture and neutral or slightly basic pH.

Trees should be planted at a density of 333 trees/ha (5x6 m) and where planting 1-2 year-old trees, saplings should be around 60-100 cm height. Irrigation is needed if summer drought occurs. Fertiliser should be applied in early spring at rates of 40 kg N/ha, 40 kg P<sub>2</sub>O<sub>5</sub>/ha and 50 kg K<sub>2</sub>O/ha.

The trees are very sensitive to weed competition during the first 5 years. Thinning and pruning may be required, depending on tree growth.

## How to graze

A stocking rate of 1-2 sheep/ha is recommended in the Mediterranean regions. With summer and winter fodder supplementation livestock can remain in plantations all year. Sheep can be introduced in the first years of plantation as the walnut is not palatable during this period. However, trampling damage should be avoided by using tree protection guards during the first 5-6 years. No damage will be caused after this time as the trees would have gained a sufficient height so that the sheep will no longer be able to reach the crowns.

## How to sow legumes

A mix of forage legumes (annual species of *Trifolium spp.*, *Medicago spp.* and *Ornithopus spp.*) can be sown at a density of 20 kg seeds/ha to a soil depth of 0.5-1.0 cm. In the first year, pasture should only be grazed after crops maturation to ensure self-seeding in the following years.

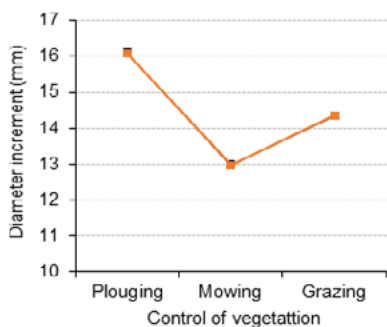


## Advantages

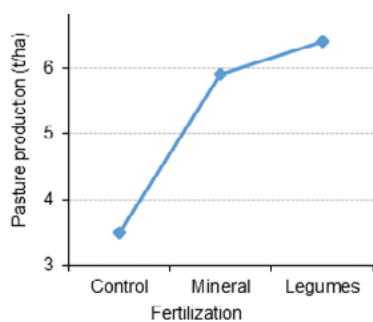
The implementation of a silvopastoral system provides short- and medium-term outputs, reducing inputs and, consequently, improving the profitability of the farm while optimising environmental functions. Grazing under walnut plantation reduces fire risk, the competition between trees and weeds, and the financial costs for controlling competition (mowing, herbicides). The sowing of legumes, as an alternative to applying mineral fertilisers, increases available nutrients in soil (especially N), improves pasture production and quality, and optimises the environmental functions of plantations.



Legume sowing under walnut trees Ref : TE. Juárez



Annual increments of walnut stem diameter after 3 years of soil treatments



Pasture production in 2013 two years after sowing

**María Lourdes LÓPEZ**  
**Gerardo MORENO**

lurdesld@unex.es  
Universidad de Extremadura  
INDEHESA – Plasencia, Spain  
company Bosques Naturales  
[www.agforward.eu](http://www.agforward.eu)

November 2017

This leaflet is produced as part of the AGFORWARD project. Whilst the author has worked on the best information available, neither the author nor the EU shall in any event be liable for any loss, damage or injury incurred directly or indirectly in relation to the report.

## How to manage walnut trees

Thinning and pruning must be carried out during tree growth. Pasture and livestock management must include consideration of the need to produce good quality timber. The mixture of self-seeding legume species has a good persistence under shade conditions and with medium grazing pressure (~0.5 LU/ha).

Grazing improved tree growth compared to mowing. In the short term, we did not find any difference among treatments, but with time it is expected that grazing would favour the tree growth more than the other treatments as grazing improved the soil conditions slightly (soil moisture, C and N cycle).

In the second year after sowing, legumes gave a similar yield as the fertilised pasture (5.9-6.4 t/ha) and both these yields were higher than in the plot receiving no fertiliser (3.5 t/ha).

## Further information

- López-Díaz ML, Rolo V, Moreno G (2013). Manejo silvopastoral para la producción de madera de calidad: bases funcionales, productividad y servicios ambientales. 6º Congreso Forestal Español. Monte: Servicios y desarrollo rural. 10-14 junio 2013 Vitoria-Gasteiz. pp. 1-10.
- López-Díaz ML, Moreno G, Bertomeu, M (2014). Pasture management under hardwood plantation: legume implantations vs. mineral fertilization. 2nd European Agroforestry Conference. Book of Abstracts. In Palma JHN (eds.). 4-6/06 Cottbus, Germany, pp.10-13.
- López-Díaz ML, Bertomeu M, Benítez R, Arenas-Corraliza G, Moreno, G (2016). Carbon sequestration in intensive hardwood plantations: influence of management. 2016. Celebrating 20 years of Agroforestry research in Europe. 3rd European Agroforestry Conference. European Agroforestry Federation. Montpellier, France. 23-25 May 2016. pp. 178-181.
- López-Díaz ML, Benítez R, Moreno G (2017). How do management techniques affect carbon stock in intensive hardwood plantations? *Forest ecology and management* 389: 228-239. <http://dx.doi.org/10.1016/j.foreco.2016.11.048>. Elsevier.