

Effect of tree species and density on pasture production in Galicia, Spain

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Introduction Galicia produces 50% of the forest products of Spain. Livestock production earns 62% of the income of the agrarian sector in Galicia. Afforestation has been very important in the last decade to such an extent that the area of forest and woodlands now covers 62% of Galicia. It is necessary to increase the rate of return on investments in planted forests in order to avoid rural depopulation through improvement of rural development and welfare. This paper reports on the effect of combining pastures with trees.

Materials and methods The study was conducted in an acid ($\text{pH}_{\text{water}} 5.5$) sandy and soil in Castro Riberas de Lea, Lugo, Galicia, NW Spain, with a mean annual precipitation of 800 mm and mean monthly temperature of 11.6 °C over the last 20 years. *Pinus radiata* and *Betula alba* were planted in 1995. Each species was planted at two densities (870 and 2500 trees/ha) and each plot consisted of 25 trees. The trees of the 2 species had a mean height of 5 and 4 m in 2001, respectively. *P. radiata* was pruned to 2 m at the start of 2001. Experimental pasture plots were established within the tree plots after ploughing and fertilisation with 154 m³ of dairy sewage sludge (160 kg N, 85.9 kg P₂O₅ and 23.4 kg K₂O per ha) and sowing with 25 kg/ha of *Lolium perenne* cv. Brigantia, 4 kg/ha of *Trifolium repens* cv. Artabro and 4 kg/ha of *T. pratense*. Inorganic fertiliser at the rate of 500 kg/ha of 8:24:16 (N,P,K) and 40 kg/ha of ammonium nitrate were applied between 1998 and 2001 at the end of March and after the second harvest. Herbage was sampled in May, June, July and December by cutting all the herbage between 4 inner trees.

Results Rigueiro *et al.* (2001) reported the first results of this experiment. Pasture production was significantly higher in plots with a low tree density, but higher than yields obtained from the open sward. The year of study (2001) had abnormal precipitation, with 955 mm in May, only 12mm in June and 70mm in July, equivalent to 40%, 48% and 26% of the 20-year mean rainfall. Rain may cause leaching of nutrients and therefore reduce initial pasture production in sandy soils. The presence of tree cover can reduce N leaching as possibly occurred in the plots of low tree density compared with the open sward (Fig. 1). However, pasture production was reduced at the high tree density because of reduced light penetration to the sward. Tree species also affected initial pasture production, being higher with *B. alba* as the canopy of this tree allows greater light transmission to the sward. Pasture production at low tree density was twice that in the open sward at the July harvest, as it reduced the effect of drought.

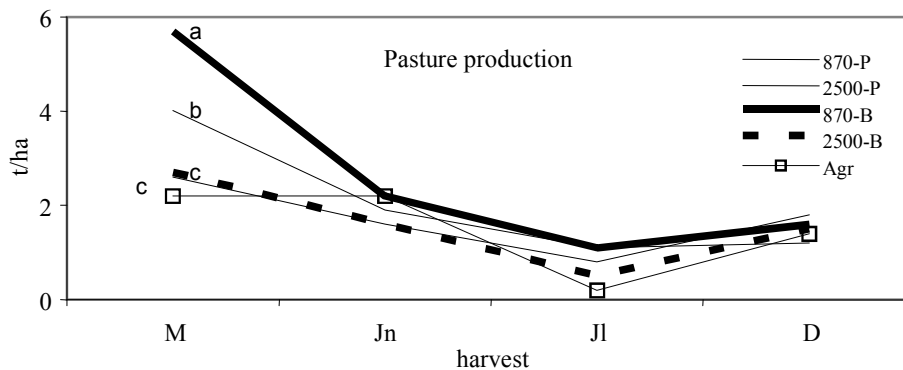


Figure 1 Mean herbage production in combination with *Pinus radiata* (P) and *Betula alba* (B) and open sward (Agr.) Letters indicates significant differences between means at each harvest.

Conclusion Silvopastoral systems can extend the grazing season with at the proper tree density, improving nitrogen efficiency.

Reference

Rigueiro-Rodríguez, A., R. M. Mosquera-Losada, & E. Gatica-Trabanini (2000). Pasture production and tree growth in a young pine plantation fertilized with inorganic fertilisers and milk sewage sludge in northwestern Spain. *Agroforestry Systems*, 48, 245-256.