



Bio-economy products: alternative uses of shrubs

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Shrubs are one of the two possible types of the woody perennial component of the agroforestry systems. Shrubs can be placed in arable lands constituting or as part of the hedges or hedgerows in silvoarable areas or in the middle of the plots as part of feed of the silvopasture practices. Management of the shrub hedges is time consuming but helps to reduce the effect of winds on croplands while delivering products usually biomass that can be used as fuel for heating. Some animals can also consume the shrubs during shortage periods contributing to increase the resilience of livestock farming systems. Shrubs can also be used as a source of nutrients for the soil. In Galicia, legume shrubs were traditionally sown to increase the soil fertility and after processing were used as a fertilizer. The most used legume species was *Ulex europaeus* with a productivity that can be over 100 Mg DM ha⁻¹ after 8 years. The plants were harvested and used as animal bedding that enriched with their faeces and urine the quality of the shrubs, reducing the Carbon/Nitrogen relationship and therefore improving the release of nutrients when applied to arable lands. The area where the legume shrub was sown was sown with cereals after the shrub harvesting. The production was called "trigo limpio" or "clean wheat" due to the lack of weeds that the wheat has in the first wheat harvest after the shrub was harvested. The lack of weeds could be associated either to the soil

generated by the shrub in the area that buried the weed seeds in deep soil layers that make these seeds unable to germinate or to the alleopathic compounds that the shrub left into the soil after the shrub was harvested. The use of *Ulex europaeus* as a source of nutrients was extended in the region before the fertilizers appeared in the modern agriculture, meaning that 33% of the Galicia land was occupied by *Ulex europaeus* (1 million hectares). Moreover, the high level of organic matter introduced in the soil that it is easily decomposed (thanks to the reduced C/N ratio) was also a way to reduce the aluminium toxicity in the soil, therefore acting as an organic amendment besides as a fertilizer. Nowadays, the good nitrogen content of legume shrubs could be used as part of the compost, usually poor in this element. Likewise the tree species, shrubs can be a source for textile, biomass and bioplastics, among other uses.



Figure 1. Hedge used as windbreak in a cereal crop.

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