



Hybrid Walnut Silvoarable Systems: use of G (tree basal area) as an index for predicting tree-crops interactions

www.eurafagroforestry.eu/afinet/

In modern agroforestry systems, with intercropping of herbaceous crops and hybrid walnut (NG23) for timber production, the overall system profitability is strongly affected by a modulated balance between tree densities and the duration in time of the production of the intercrops, which tends to decrease with increasing tree age and size due to tree shading.

Thus, it is of fundamental importance to correlate the intercrop yield and tree age and growth, using simple parameters, such as the Tree Basal Area ($G = (3.14 / 4000) \times D^2 \times d$; with: D = tree diameter at 1.3 m from the ground; d = trees number ha⁻¹) (Nissen et al., 2002).

Research was conducted in Italy, in experimental plantations of hybrid walnut, associated with wheat, clover and natural meadow, identifying the following equations between G and CRY (%), i.e. the relative production of intercrop compared to the same crop under non-shaded condition. For wheat, $CRY = -6.21G + 100$; for clover, $CRY = -0.04G + 100$; for natural meadow, $CRY = -3.9G + 100$ (Perali et al 2009; Paris et al 2013). These equations can be used for the optimization of the agroforestry model, depending on the planting density and tree growth rate.

For example, with a density of 50 tree ha⁻¹, the CRY of wheat remains well over 80% up to 23 years from the tree planting, which is up to more than two thirds of the tree harvesting cycle. For the density of 83 trees ha⁻¹, the wheat CRY will start to decrease below the 80% threshold at the 17th year of planting.



Figure 1. Intercropping of walnut trees

References

- Nissen T.M. & Midmore D.J. (2002). Stand basal area as an index of tree competitiveness in timber intercropping. *Agroforestry system*, 54: 51-60.
- Perali A (Academic Year 2011/2012) PhD Thesis: Modelli culturali per lo sviluppo di sistemi agroforestali nell'ambito della Politica Agricola Comunitaria. University of Tuscia, Viterbo, Italy
- Paris P, Perali A, Pisanelli A, 2013. Uso di G, area basimetrica, per la modellizzazione dell'interazioni tra alberi e colture erbacee consociate in sistemi silvoarabili di noce da legno. Poster. IX Congresso Nazionale SISEF, "Multifunzionalità degli ecosistemi forestali montani", Libera Università di Bolzano/Bozen, 16-19 Settembre 2013.

Pierluigi Paris

CNR-IRET (Consiglio Nazionale delle Ricerche - Istituto di Ricerca sugli Ecosistemi Terrestri)

Edited by: Maria Rosa Mosquera-Losada (USC)

Layout by: Javier Rodrigo Rigueiro