



Effect of forest mixture and management practices on plantation productivity and water use efficiency of *Quercus robur* L.

Francesco Pelleri (1), Angela Puoti (2), Maria Chiara Manetti (1), Dalila Sansone (1), and Giovanna Battipaglia (2)

(1) CREA, CREA FL, Italy (francesco.pelleri@crea.gov.it), (2) Department of environmental sciences, second University of Naples, Italy

The relationship between climate change mitigation measures and water is a reciprocal one. Mitigation measures can influence water resources and their management, and it is necessary to realise this when developing and evaluating mitigation options. Indeed, it is important that carbon sequestration strategies consider all environmental consequences, especially in regions, such as Mediterranean area, where water resources are expected to be stressed by population growth and climate change. Tree crops and forestry management strategies (such as plantation, cuts, N fertilization by chemical or by N-fixing species, tree mixture, etc) may affect plant' intrinsic water use efficiency (WUE_i) with contrasting results on the carbon sequestration in the long-term trend. However, scanty information is available on relationships between the climate constraints, water use efficiency and effects on the total carbon sequestration of plantations. The main aim of this study is to quantify the differences in WUE_i of *Quercus robur*, a widely planted forest tree species in Europe, under different management practices and tree mixture. The result can be a support for land management decisions with the choice of tree species allowing the maximization of carbon sequestration for a given water budget. Our approach combines the analysis of the stable isotopes of carbon (^{13}C) and oxygen (^{18}O) in annual tree rings. Tree rings are very useful archives to reconstruct changes in tree growth in response to environmental conditions. The combination of ^{13}C and ^{18}O will allow us to suggest which physiological traits, i.e. photosynthesis and/or stomatal activity, respectively, contributed most to the variations in WUE_i. Preliminary results show that growth and WUE_i of *Quercus robur* are strongly influenced by the N availability linked to the co-existence with a N-Fixing species. Further, the silviculture practices seem to determine a better use of the water resource and the maintenance of nitrogen fixing species for long time could allow to preserve a high efficiency of the tree plantation.