



## **Sustainability of soil deep loosening as an amelioration measure preceding site afforestation**

Marco Hümann (1), Raimund Schneider (1), Gebhard Schüler (2), and Christoph Müller (1)

(1) University of Trier, Soil Science, Trier, Germany (m.huemann@uni-trier.de), (2) Research Institute for Forest Ecology and Forestry Rhineland-Palatinate, Trippstadt, Germany

It is well accepted that the climatic change is proceeding and many countries have increased the interest in afforestation of arable soils due to surplus agricultural production or ecological problems. However, the existing soils relevant for afforestation often possess poor properties for an effective growth of plants (marginal earning sites) and are in many cases poor in nutrients, extremely dry or very wet as well as compacted and skeletal. Hence, it is advisable to improve these sites in terms of an ecological and economic forest growth and to prepare for changing environmental conditions due to the climatic change (expected dryer summers and wetter winters, study is funded by the INTERREG IVB-project ForeStClim). Deep loosening measures as amelioration methods are suited to increase the water availability and water storage capacity and to enhance soil physical properties. Deep loosening measures were applied in 1993 and 1994 on prospective afforestation sites in the German low mountain range (Eifel and Hunsrück). The plots were subdivided and soils were treated by different loosening machines. Fourteen years later in 2008 the areas were reinvestigated including soil properties such as different measures of the water balance and the resulting plant development. The latest findings show that forest growth on marginal earning sites is substantially improved after previous soil physical amelioration. Soil bulk densities have been lowered sustainably and water absorption as well as water storage capacity were still effectively increased. Hence, positive effects regarding the landscape, the ecology and the economy can be reached by a successful operated deep loosening of the soil and due to that the enhanced growing of the trees (averaged the trees are 3-5cm bigger in diameter and 1-2m higher in growth). Also in spite of shifting environmental conditions due to the climate change the positive and sustainable effects of deep loosening on the soil fertility and water balance are relevant for the tree growth on afforested sites and replanted silvicultural areas.