



Influence of Robinia pseudoacacia short rotation coppice on soil physical properties

Morvan Xavier (1), Bertrand Isabelle (2), and Gibaud Gwenaelle (3)

(1) University of Reims, GEGENAA, EA 3795, 51100 REIMS, France (xavier.morvan@univ-reims.fr), (2) INRA, UMR 614 Fractionnement des AgroRessources et Environnement, Reims, 51100, France, (3) ONF, Département Recherche, Développement et Innovation, 60200 Compiègne, France

Human activities can lead to the degradation of soil physical properties. For instance, machinery traffic across the land can induce the development of compacted areas at the wheel tracks. It leads to a decrease in porosity which results in a decrease of the hydraulic conductivity, and therefore, prevents water infiltration and promotes surface runoff. Land use, soil management and soil cover also have a significant influence on soil physical properties (Kodesova et al., 2011). In the arable land, surface runoff and soil erosion are enhanced by the absence of soil cover for part of the year and by the decrease of aggregate stability due to a decline of soil organic matter.

In that context, few studies focused on the effects of a Robinia pseudoacacia short rotation coppice (SRC) on soil physical properties. Therefore, this study aims to determine the effect of the conversion of a grassland in a SRC on soil physical properties. These properties have also been compared to those of arable land and natural forest.

For that, in several plots of the experimental farm of Grignon (30 km west of Paris, France), different measurements were performed: i) soil water retention on a pressure plate apparatus for 7 water potential between 0 and 1500 kPa, ii) bulk density using the method for gravelly and rocky soil recommended by the USDA, iii) aggregate stability using the method described in Le Bissonnais (1996), and iv) soil hydraulic conductivity using a Guelph permeameter. All these measurements were performed on the same soil type and on different land uses: arable land (AL), grassland (GL), natural forest (NF) and short rotation coppice (SRC) of Robinia pseudoacacia planted 5 years ago.

Soil water retention measurements are still under progress and will be presented in congress. Bulk density measurements of the AL, GL and SRC are not significantly different. They ranged from 1.32 to 1.42. Only the NF measurements are significantly lower than the other (0.97). Aggregate stability measurements showed that the SRC soil had the most stable aggregates compared to the other land uses. SRC also had the highest infiltration rates (656 mm.h⁻¹) compared to NF (54 mm.h⁻¹), GL (23 mm.h⁻¹) and AL (8 mm.h⁻¹).

Analyses and explanation of these results are still under progress and will be presented in congress.

Kodesova, R., Jirku, V., Kodes, V., Muhlhanselova, M., Nikodem, A., Žigová, A., 2011. Soil structure and soil hydraulic properties of Haplic Luvisol used as arable land and grassland. Soil and Tillage Research 111 (2), pp. 154-161.

Le Bissonnais Y., 1996. Aggregate stability and assessment of soil crustability and erodibility: I theory and methodology. European Journal of Soil Science 47, 425-437.