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## SOIL STRUCTURE AND ROOT DISTRIBUTION OF BIOMASS CROPS IN A DEEP LOAMY SOIL

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The development of biomass crops for energy production is expected to provide significant fossil energy substitution and greenhouse gas mitigation. High yield per unit area and low environmental impacts are needed to ensure a sustainable development of biomass crops. A long term experiment was established in 2006 in Northern France in a silt loam to compare several candidate crops for biomass uses. The crops were annual crops (*Sorghum bicolor* (L.) Moench and *Triticosecale* Wittmack), multi-annual crops (*Festuca arundinacea* and *Medicago sativa*) and perennial C4 grasses (*Miscanthus x giganteus* and *Panicum virgatum*).

A study was conducted in spring 2010 to characterize root distribution and soil structure under these biomass crops. One pit was dug down to 3 m depth and 1.8 m width in each experimental treatment. Soil structure was observed in the top layer with the “profil cultural” method. The proportion of the soil areas with a massive structure and no visible macropores was determined in the 0-30 cm layer. The vertical root distribution was observed using the trench profile method.

Visual soil assessment showed severe compacted volumes in treatments with perennial crops. In contrast compaction was low with annual crops. Compaction under perennial crops resulted from both late harvesting in winter and no tillage. The result also showed high discrepancy between species concerning maximal rooting depth and roots distribution. Perennial species and *Medicago* had roots deeper than 2.5 m whereas *Festuca* and *Triticosecale* had roots down to 1.5 m and *Sorghum* to 1 m depth.

The high contrast between crops as regard to soil structure and root distribution is likely to affect both the long term production and environmental impacts of these systems. Deep rooting could influence the mineral nutrition, the water consumption and drainage into the ground. N<sub>2</sub>O emission could be favoured by compaction.

- **Keywords:** biomass crops, soil structure, soil compaction, root distribution, environmental impacts
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