



Biological and physical recovery of soil after compaction

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the forest operations using heavy machines, soil will be extremely harmed by the compaction. Soil compaction is one of the main causes of reduction in forest productivity, since it affects the soil physically, which contributes to disturb the edaphic life as whole. In the first time soil compaction decreases porosity, which leads to increase soil strength and reduce the respiration into the soil. Soil type which is related to the texture is one of the most important factors that determine the soil compressibility and sensibility to the compaction, which is increase when the soil is more finely textured. Soil compaction and its impacts in soil health is widely studied, while the recovery of soil to the optimal status after compaction is less documented. In this study, the capacity of soil to recover the initial status after a compaction is examined biologically and physically, following a diachronic approach at multi-decades' scale. This study is conducted on luvisols from the forest of Compi egne (North-France).

In order to highlight and identify the trails of compaction (ruts), LRM (Local Relief Modelling) images were derived from airborne LiDAR (Light Detection And Ranging) data. LiDAR treated images was combined with ancient aerial photographs, then using the ONF (Office National des For ets) management plan, a compaction chronosequence is established. This chronosequence is composed of four compaction trails categories which is aged 0, 10, 24 and 45 years old.

The physical and biological recovery was studied by (i) penetration resistance measurements using a cone penetrometer, (ii) soil respiration measurements using a Licor system Li-6400 and (iii) microarthropods biodiversity as a biological index of soil quality. Compaction trails were taken as a compacted soil and beside it the control soil was taken in undisturbed soil.

The results show a difference between physical and biological recovery. Physically, the compaction persists in a soil profile of 0-30 cm even after 45 years. A gradual restoration with depth was found by the recovery of penetration resistance in the first 5 cm of profile after 10 years, 19 cm after 24 years and 25 cm after 45 years. In contrary, biologically, the luvisol was recover within less than 10 years, when the respiration decreases significantly with the compaction in trails recently compacted (age 0), while there is no significant difference between compacted soil and undisturbed soil 10, 24 and 45 years ago. Likewise, the microarthropods diversity shows a highly reduction in the trails recently compacted (age 0) while it was normal in the trails compacted from 10, 24, and 45 years, like the undisturbed soil.