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Assessment of C storage of a Technosol under short rotation coppice management

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Technosols contribution to C storage have been seldom considered. However, a recent study highlighted their relevance for C storage (Allory et al. 2022). Indeed, with an average C content in the first 30 cm of 4.3% and soil organic carbon stock of 73 t ha^{-1}, this soil category might be a real asset to contribute to the overall carbon storage of the soil compartment. These high values are mostly explained by the "recent" history of these soils and the significant contribution of the artefacts they contain. These materials, created, substantially modified or brought to the surface by humans, can contain high quantities of carbon explaining the high, sometimes extreme, C content values measured. These materials might have been introduced to Technosols through mining and urban activities (e.g. wood, charcoal, coal, coked-coal, asphaltic concrete), or restoration and reclamation processes (e.g. compost, biochar, sewage sludge). For some of these artefacts their formation, either natural for fossil material, or industrial for charcoal, coke or biochar, has strongly stabilized the organic matter and the corresponding C compartment can be considered as stable. The main scientific issues are then i) to assess the effective stability of this "stable" anthropic organic matter and ii) to evaluate its interaction with freshly added natural organic matter and potential stabilizing ability.

To do so, a pilot soil plot was set-up consisting of 1 m profile of mixed moderately contaminated soil. A short rotation coppice of *Robinia pseudoacacia* and *Alnus incana* was implemented in March 2019 together with a mixed soil cover of *Medicago sativa* and *Phacelia tanacetifolia*. Over the 2.5 following years soil carbon content and stocks along with physical and chemical soil properties and vegetation evolution were measured. Transfer of residual pollution was assessed as well to insure the innocuity of the overall phytomanagement process.

To date, the length of the monitoring period remains too short to draw definite conclusions regarding the additional carbon storage capacity of such Technosol. These systems present a high spatial variability and the intrinsic nature of the C along with the high C content result in analytical issues. To partly overcome these difficulties, an analytical approach using Rock-Eval® analysis has been tested. It enables to discriminate between original stable anthropic C and freshly added biomass from plant cover and/or initial compost amendments. As a result, the pilot plot displays high C storage capacity and both mineral and organic artefacts appear to offer stabilizing surfaces to freshly added C. Moreover, in depth C storage can also be achieved.