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Titel

Soil rehabilitation in semi-arid Spain: Long-term effect of afforestation and land abandonment on soil quality

Abstract

In response to the increasing amount of abandoned agricultural land in the European Mediterranean area during the last century, afforestation projects have been conducted as a measure for soil protection and ecosystem restoration. Despite the research on the impact and effectiveness of these projects, the long-term effect on soil quality has hardly been studied. Especially the linkage between soil physical, chemical and hydrological properties is lacking.

An intensive fieldwork has been carried out in Murcia, southeastern Spain to study the effects of land abandonment and afforestation on soil quality along a chronosequence and included two afforested areas, planted with *Pinus halepensis* trees in the early '70s and '90s. Samples were taken to study changes in soil physical and chemical quality (e.g. Aggregate stability, C_{org} , N, P, K, Na), Soil Organic Carbon (SOC) stocks and soil hydrological properties, such as infiltration and water retention. A comparison was made between afforestation projects, abandoned agricultural plots of similar age, semi-natural vegetation and cereal crop fields. As the natural vegetation is characterized by a spotted pattern of bare areas and trees, forming so-called "islands of fertility", both bare and vegetation covered sub-sites were included.

Our results indicated that under secondary succession on abandoned fields, soil quality showed a marginal non-linear improvement over the studied period. The afforestation showed a much more pronounced linear increase, resulting in a soil quality comparable to what can be found under semi-natural vegetation. After 40 years afforestation showed to be successful in the restoration of the natural soil hydrological functioning, while the abandoned sites only indicated small changes. For this case study, in semiarid areas, afforesting is the best way forward as it has a clear effect on enhancing soil quality compared to secondary succession on abandoned agricultural fields.