Impacts of land use changes on physical and chemical soil properties in the Central Pyrenees

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Soils and vegetation tend to evolve jointly in relation to climate evolution and the impacts of human activity. Afforestation has been one of the main policies for environmental management of forest landscapes in Mediterranean areas. Afforestation has been based mainly on conifers because they are fast-growing species, and also because it was believed that this would lead to rapid restoration of soil properties and hydrological processes, and the formation of protective vegetation cover. This study analyses the effects of afforestation on physical and chemical soil properties. Specifically, we addressed this research question: (i) How do soil properties change after land abandonment?

The 11 microsites considered were: Afforestation Pinus sylvestris (escarpment, terrace and close to the stem), Afforestation Pinus nigra (escarpment, terrace and close to the stem), natural shrubland, grasslands, bare lands, and undisturbed forest site (pine cover and close to the stem). An extensive single sampling was carried out in September 2014. We systematically collected 5 top soil samples (0-10 cm) and 3 deep soil samples (10-20 cm) per microsite (88 composite samples in total). These properties were analysed: (i) soil texture, (ii) bulk density, (iii) pH and electrical conductivity, (iv) total SOC, (v) Total Nitrogen, (vi) organic matter, (vii) $CaCO_3$ and (viii) aggregate stability. Statistical tests have been applied to determine relationships between the different soil properties and are used to assess differences between different soil samples, land use areas and soil depths. Implications of reafforestation for soil development and environmental response are discussed.