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Soil organic matter dynamics after land use change under contrasting climates

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In Europe and Russia, large areas of marginal agricultural lands are being abandoned or transformed to forests, which may contribute to enhancing the C sink capacity of terrestrial ecosystems and alter the SOM composition and stability. However, because of regional variations, it is difficult to assess the impact on the global C balance. The aim of the study was to identify the SOM dynamics and quality after cessation of cultivation in two selected areas under contrasting climate.
For the study, two representative chronosequences from a boreal area (Moscow region, Russia; 54°49N'; 37°34'E) and a humid temperate area (Galicia, Spain; 43°07N' 7°49W') were selected. The boreal chronosequence (*Luvic Phaeozems*; mean annual temperature, MAT = 5.4°, annual precipitation, AP = 640 mm) includes arable, croplands abandoned 6, 15, 30 yrs ago, and secondary deciduous forest of 50 years. The temperate chronosequence (*Humic Umbrisol*; MAT = 10°, annual precipitation, AP = 2400 mm) consist of pasture and plots afforested by *Pinus radiata* for 4, 7, 22, and 30years ago. SOM quality of topsoil was characterized by ^{13}C CP-MAS NMR spectroscopy, differential scanning calorimetry, and bio-kinetic methods.
The land use change led to increases in moderate gains in SOM both under boreal and humid temperate climate, although the studied soils differed in the rate and pattern of SOM dynamic. Although all SOM compounds increased in abundance after the land use change, the resulting SOM (after 30-50 yrs of land conversion) was more stable (higher aromaticity, increased C/N, higher T50, and lower C labile) than the agricultural original soil. This implied the longer turnover times for the SOM, which contributed to the long-term C sequestration after conversion of agricultural areas to abandoned or afforested lands.

Key words: SOM, soil microbial activity, ^{13}C CP-MAS NMR, DSC, soil carbon sequestration, land use change