



Soil carbon balance on drained and afforested transitional bog in forest research station Vesetnieki in Latvia

Ainārs Lupiķis (1) and Andis Lazdiņš (2)

(1) Latvia State Forest research Institute "Silava", Salaspils, Latvia (ainars.lupikis@inbox.lv), (2) National forest competence centre, Latvia (andis.lazdins@silava.lv)

Around 0.8 mill. ha forests in Latvia are located on organic soils and 0.5 mill. ha of these forests are drained. Drainage of organic soils alters carbon stock and may have impact on the climate change. The aim of this study is to analyse the impact of drainage on a soil carbon stock in transitional bog (average growing stock before drainage 50 m³*ha⁻¹) located in central part of Latvia in research station „Vesetnieki”. Drainage was done in 1960. Average peat thickness is around 4.5 m; dominant tree species are pine (*Pinus sylvestris* L.) and spruce (*Picea abies* Karst.) with average growing stock 226 m³*ha⁻¹ and 213 m³*ha⁻¹. Volumetric peat samples were taken from soil surface down to 80 cm depth in 30 sample plots in drained sites and non-drained areas (transitional bog), which have been left as a control. Bulk density, carbon content in peat was determined to evaluate carbon stock changes in soil. Ground surface levelling in drained sites was done before drainage and repeatedly in 1966, 1970, 1975, 1977, 1982 and 2014 to calculate peat subsidence.

The rate of peat subsidence after drainage increased rapidly, and 14 years after drainage 15.8 cm decrease of the surface level was found. The rate of the peat subsidence decreased later, and the ground level reduced by 9.9 cm in the following 40 years, reaching 25.7±3.5 cm from initial ground surface level in the 2014. The rapid decrease of the surface level after drainage can be explained by physical alters and by decomposition of the peat surface layers, however, it is not possible to assess now, which of these processes dominated. However, the significant ($\alpha=0.05$) increase of the peat bulk density and carbon content in upper layers (0-80 cm) in drained sites compared to non-drained leads to conclusion that the compaction was the dominating process. Average carbon stock (0-80 cm deep soil layer) in non-drained areas is 339±29 tons*ha⁻¹ and 513±27 tons*ha⁻¹ in drained sites. We compared carbon stock in upper 80 cm soil layer in transitional bog (339±29 tons*ha⁻¹) with peat layer in drained sites 54.3 cm corresponding to 80 cm in non-drained (359±19 tons*ha⁻¹). The study reveals that soils in drained sites have accumulated 0.36 tons*ha⁻¹*a⁻¹ more carbon than soils in non-drained sites, however the difference on carbon stock between sites is not statistically significant ($\alpha=0.05$). If non-drained organic soils are considered to be a carbon sink or at least not a carbon source, then we can conclude that drained organic soil in research station „Vesetnieki” in 50 years period did not become a carbon source.