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CO_2 and CH4 fluxes from abandoned peat extraction areas: the role of berry cultivation

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Abandoned and unmanaged peat extraction areas loose carbon through carbon transport in water and due to emission of greenhouse gases - carbon dioxide (CO_2) and methane (CH_4). At the same time, those sites are excluded from production and have a low ecological value. One of the after-use strategies for abandoned peat extraction sites is berry production which, contrary to the traditional peatland restoration, can be profitable for land owners. Also, it may have a positive effect on reducing carbon losses from peat compared to abandoned and unmanaged peat extraction sites. The aim of this study is to compare results of the first-year CO_2 and CH_4 flux measurements in unmanaged former peat extraction sites and sites used for cranberry and blueberry cultivation in Latvia on an ongoing two-year project.

We measured soil CO_2 emission and CH_4 fluxes using closed chamber method and CO_2 net ecosystem exchange (NEE) using EGM-5 CO_2 analyzer once a month from December 2016 to November 2017 from following sites: four abandoned peat extraction sites with bare peat (BP), three abandoned peat extraction sites with ground vegetation cover (VP, covered with mosses, cottongrass, dwarf shrubs etc.), three cranberry and three blueberry cultivation sites.

CO_2 and CH_4 fluxes from different management types varied but were not significantly different between different practices. The smallest NEE was measured from cranberry sites (0.5 Mg CO_2-C ha^{-1} $year^{-1}$), whereas NEE from BP, VP, and blueberry sites were 1.3, 1.8 and 1.4 Mg CO_2-C ha^{-1} $year^{-1}$, respectively. In case of NEE from blueberry sites, C uptake by roots and woody biomass was not included, covering only NEE of ground vegetation. The lowest CH_4 fluxes were measured in cranberry and BP sites (0.005 and 0.002 Mg CH_4-C ha^{-1} $year^{-1}$, respectively), while in VP and blueberry sites the corresponding values were 0.057 and 0.033 Mg CH_4-C ha^{-1} $year^{-1}$. First year results showed that cranberry and blueberry sites produce less or similar amount of CO_2 and CH_4 as unmanaged sites. If the carbon uptake in woody and root biomass by blueberry plants would be included in calculations, both cranberry and blueberry sites would be admittedly smaller sources of CO_2 than abandoned and unmanaged peat extraction sites. Thus, cultivation of cranberries and/or blueberries on abandoned peat extraction areas could be beneficial from the point of view of both economy and environment.

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