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Is it possible to cultivate peatlands climate- and environment-friendly?

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Peatlands are actively drained and cultivated especially in Northern Hemisphere. In Finland peatlands comprise one third of the total land area while over half of these are drained. Cultivated peatlands are regionally important for food and grass production and for spreading cattle manure. Agriculture comprises one of the biggest sources of anthropogenic greenhouse gas (GHG) emissions and cultivated peatlands may have especially high emissions of carbon dioxide (CO_2) and nitrous oxide (N2O). In addition to high GHG emissions, cultivated peatlands cause high nutrient and organic carbon loading to waterways.

Water table level is known to be one the key factor affecting GHG emissions. Drainage increases the oxygen content of the peat and accelerates the peat decomposition as well as mineralization processes. Carbon is emitted as CO_2, while CH4 emissions decrease significantly compared to pristine ones or peatland may turn into a CH4 sink. Nitrous oxide emissions can also increase substantially and drainage may cause high N2O emissions specifically in nutrient rich peatlands. Adjusting the water table level to certain depth is suggested to help to reduce GHG emissions. However, to control the water table level in peat soils is challenging with variable weather conditions. Also, too high water table disturb machinery operations in the fields.

We study the effects of peatland cultivation on both GHG emissions and water run-off quality in Ruukki study site in Northern Finland. The site is operated by Finnish Natural Resources Institute (LUKE). The total area of the field is 19.5 ha and the peat depth varies between 30 and 70 cm. The field is divided to 6 different sections, where the water table, soil moisture, leaching of water and its quality can be monitored. We combine detailed hydrological analysis and modelling, soil analysis with high-resolution GHG measurements and utilize latest measurement technologies to study water table manipulation possibilities in cultivated peatlands.

The aim of the project is to have integrated view of the effects of peatland cultivation on environment and climate by combining both hydrological and biogeochemical methods. The study is part of international PEATWISE-project (Wise use of drained peatlands in a bio-based economy: development of improved assessment practices and sustainable techniques for mitigation of greenhouse gases).