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Effect of organic waste compost on the crop productivity and soil quality

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Sustainable use of fertilizers is important for maintaining balanced nutrient cycling in agro-ecosystem, soil quality and crop productivity. Considering the high costs and energy demand of mineral fertilizers, it is increasingly important to use more alternative nutrient sources such composts. Nutrient release from organic fertilizers is slower compared to mineral fertilizers and thus their effects need to be evaluated over longer time periods. There is lack of knowledge on the residual effects of organic fertilizers, especially in Nordic climatic conditions. Residual effect of organic fertilizers is in most cases studied with animal manures, but even rare are studies with non-manure based composts. The aim of current study was to evaluate first year direct effect and residual effect of waste compost on the crop productivity and selected soil parameters. Crop rotation field experiment to reveal direct effect of compost to the spring barley yield and residual effect to potato and spring wheat yield was conducted in Tartu, Estonia on pseodopodzolic soil with low humus concentration (<2%). Compost was produced from source separated food and green waste, and category III animal by-products; and composted in aerated covered static piles for 6 weeks and after that matured in open windows for minimum six months. Compost was applied to soil with ploughing in autumn before spring barley growing season (in years 2012–2014). Compost was applied in three norms according to total N (200, 275 and 350 kg/ha). In addition there was unfertilized control plot and all experimental variants were in three replication with plot size 50 m2.
First year effect of compost increased barley yield by 40-50%, first year residual effect resulted in increase of potato yield by 19-30% and second year residual effect to wheat yield was in range from 8 to 17%. First year residual effect to the potato yield was significant ($F=8.9$; $p<0.001$). All compost norms resulted significant yield increase compared to the unfertilized control plot. In the case lowest compost rate (200 kg N ha-1) yield increase was 19% (Figure 1). Second year residual effect of compost use to spring wheat grain yield was already smaller (8-17%) and statistically non-significant ($F=3.2$; $p=0.07$). Residual effect of compost is decreasing year-by-year as expected. In third growing season after application the effect is not significant but it still important to consider, especially if we take in account cumulative yield increase trough all crop rotation. Additionally changes in selected soil parameters (SOC %, pH, PK concentration) will be presented.