

Pruning removal from orchards for energetic use: impacts on SOC and CO₂-emissions

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Prunings of orchards are usually burnt or left on the soil for nutrient and organic carbon recycling. Recently the interest rose to remove prunings for energetic use. Effects of pruning removal on soil physical and chemical characteristics are expected rather in the long term. Under certain circumstances, however, soil characteristics as organic carbon content and greenhouse gas emissions might change on the short term as our literature review revealed.

The main objective of this research was to determine if pruning removal from orchards changes soil organic carbon content and CO₂-emission from soils in the short-term. We compared six different study sites in Spain, France and Germany in terms of impacts on soil chemistry (total and organic carbon) and four sites for impacts on CO₂-emissions during 2 years. A block design was set up over two rows each with two parcels where we removed prunings and two parcels where prunings were chipped and left on the soil (n=4). As soil characteristics may vary between tree rows and interrows of orchards, we sampled both positions separately. To assess the relative contribution of CO₂ emissions from carbonate and organic material, the isotopic signature of CO₂ ($\delta^{13}\text{C}_{\text{CO}_2}$) was analyzed for one orchard. Our results show that pruning removal could significantly decrease soil organic carbon in the tree row after 2 years of pruning removal, as found for one German orchard. No treatment effects were detected on CO₂-emissions. We found, however, differences in CO₂ emissions according to the sampling position in tree rows and interrows. More CO₂ emission was found for that row position per orchard with higher soil organic carbon. Isotopic CO₂ signature indicated that elevated CO₂ emissions were rather linked to higher microbial decomposition or root respiration than to the release from carbonates. As no pruning wood decomposition effect on CO₂ emissions were apparent, but soil with higher organic carbon released more CO₂, it is expected that due to slow soil organic carbon decrease several years of pruning removal are needed before a decrease of soil CO₂ emissions might be detectable. In addition, the loss through dissolved organic carbon leaching should be assessed in future studies.