



Impact of wood pruning to greenhouse gas emissions in three orchards and a vineyard

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Pruning of orchards and vineyards is usually burned or left on the soil for nutrient and organic carbon recycling. Recently the interest rose to extract pruning for energetic use. Very few studies exist that analyzed the effects of pruning removal on soil physical and chemical characteristics. This is linked to the fact that changes are expected rather in the long term, but project funding is typically restricted to 2 or 3 years. Some soil characteristics, however, as organic carbon content and greenhouse gas emissions might also change on the short term as our literature review reveals.

The main objective of this research is to determine if pruning extraction from orchards and vineyards impact greenhouse gas emissions (N_2O , CH_4 , and CO_2) from soil to the atmosphere, change soil nitrogen and carbon content or effect nitrogen leaching. Results from our study and from the literature will be compiled to formulate best management practices for sustainable pruning utilization from orchards and vineyards.

Here we compare four different study sites in a block design over two rows each with two parcels where we extracted pruning and two parcels where pruning was chipped and left on the soil ($n=4$). Comparisons were made for initial soil chemistry and greenhouse gas emissions in a cherry orchard without irrigation in Germany, a vineyard without irrigation in France, an almond orchard with drip irrigation in Spain and a peach orchard with flood irrigation in Spain. Soil greenhouse gas emissions depend on soil chemistry and soil moisture. These characteristics can be expected to vary between the tree rows and inter-rows of orchards. Therefore we took soil samples from row and inter-row positions of each study site and analyzed them for chemical parameters (pH, total C, N, S, and H, and available PO_4 , NH_4 , NO_3 , K, Mg, Ca). Additionally soil moisture and temperature data have been recorded for tree rows and inter-rows in the cherry orchard and the vineyard. Gas samples were taken with closed chambers twice a month in both row positions from all four study sites. Results reveal some initial differences of soil chemical parameter, in particular for the cherry orchard. No pruning treatment effects were found during the first growing season after treatment installation. We found, however, differences in CO_2 emissions according to the sampling position in the orchards during the summer months. CO_2 emissions were higher in the inter-row in vineyards than in the vine rows. In the cherry and almond orchard the opposite was found with higher CO_2 emissions in tree rows than inter-rows. This finding indicates that possible pruning effects on greenhouse gas emissions that might get apparent in the long term can vary according to sampling position.