

Visual versus chemical evaluation: Effects of pruning wood decomposition on soil quality in a cherry orchard (Northeast Germany).

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Returning crop residues to the soil is a well-known practice to keep a sustainable soil quality in agriculture. In an orchard, pruning material could be returned for soil and water conservation or could be removed for energy production. Pruning wood decomposition rates and their impact on soil quality and greenhouse-gas emissions depend on climate, soil type, land management and water availability. Changing the soil management from leaving wood prunings on soil to removing them from the orchard is expected to result in a slow but lasting change of soil quality. Therefore a quick and cost-effective technique for soil quality evaluation is needed. This study aims to compare pruning wood decomposition effects on soil quality determined by soil chemistry (pH, C/N-ratio) or by Visual Soil Examination and Evaluation (VSEE). In addition, treatments effects on soil quality were compared for sampling positions in tree rows versus interrows.

In a cherry orchard (Northeast Germany) six plots were established spreading over two planting rows. At each plot, three subplots with 1x (0.55 kg/m²), 2x (1.10 kg/m²) and 10x (5.50 kg/m²) the average pruning wood rates were installed in both tree and interrows. 5 months later the soils were sampled and a Visual Soil Evaluation and Examination (VSEE) was applied. To relate wood decomposition to impacts on soil quality, wood bags were placed in each plot and were sampled in time intervals of 5 weeks (till a maximum of 20 weeks). Wood decomposition was characterized by decomposition rates and changes in carbon and nitrogen contents. To assess environmental effects, CO₂, N₂O and CH₄ emissions or uptake from soils with different pruning rates were determined with the closed chamber method.

There were no significant differences in pH and C/N-ratio between the 3 pruning rates. However, pH was significant higher in the tree row compared to the interrow for the 10-fold pruning rate. The 10-fold pruning rate had significant higher VSEE-scores compared to the lowest two pruning rates. VSEE-scores in tree row were significant higher compared to the interrow position for all pruning rates. Wood decomposition resulted in a significant mass loss of 20% after 5 months, the C/N ratio of the wood showed no significant change over time. The wood decomposition rate and C/N ration did not significantly differ between positions. CO₂ emissions were higher in the highest pruning rate compared to the lowest. N₂O and CH₄ showed no clear differences.

For sustainable soil management it is valuable to know what the effect of pruning wood on the soil quality is. Higher pruning rates lead to a better soil quality, but also to higher CO₂ emissions. Through the VSEE-technique it was possible to detect soil quality changes after only 5 month of increased pruning addition. This was not achieved with the more expensive C/N-ratio determination.