

Agroforestry in temperate regions: where does the water go? Electrical resistivity tomography as a tool to help us find out.

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Recently, agroforestry systems have been recognized to provide an opportunity for “ecological intensification”, thereby increasing yield outcome while simultaneously minimizing negative impacts on the environment. Mixtures of trees and crops have the potential to capture more resources of light, water and nutrients than monocultures of trees or crops (Cannell et al. 1996). Nevertheless, few studies are available focusing on the impact of trees on soil moisture dynamics in cropped soil in temperate regions. In this study, we monitored the soil water dynamics in a corn field bordered by poplar trees in Ieper, Belgium using Electrical resistivity tomography (ERT) and classical soil tension sensors (Watermark) during the entire growing season of 2016 (May-September). We installed four ERT transects of 30 m long with an electrode spacing of 50cm. Three transects were placed in a part of the field bordered by trees and one reference transect was located in a part of the field without trees.

Next to each transect, Watermark sensors were installed to estimate the soil water tension. The data allow us to monitor the influence of the trees on the soil water depletion by the crop. We quantified the effect in space and time of mature poplar trees on soil moisture dynamics in an agricultural field sown with maize during one growing season and confirmed the ability of electrical resistivity tomography to study tree-crop interactions for water under field conditions and we delimited an area of influence of the tree on the crop using a segmented linear regression technique. With our study, we show the potential of ERT to quantify tree-crop-soil interactions for water in agroforestry systems.