



HAL
open science

Soil health in temperate agroforestry systems: What effects of tree rows and tree species?

Romane Mettauer, Alexis Thoumazeau, Samuel Le Gall, Alexis Soiron, Nancy Rakotondrazafy, Annette Bérard, Alain A. Brauman, Delphine Mézière

► To cite this version:

Romane Mettauer, Alexis Thoumazeau, Samuel Le Gall, Alexis Soiron, Nancy Rakotondrazafy, et al.. Soil health in temperate agroforestry systems: What effects of tree rows and tree species?. 5e Congrès mondial d'agroforesterie, Université Laval Québec, Jul 2022, Québec, Canada. hal-04057325

HAL Id: hal-04057325

<https://hal.inrae.fr/hal-04057325>

Submitted on 4 Apr 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Soil health in temperate agroforestry systems: What effects of tree rows and tree species?

Romane Mettauer^{1,2}, Alexis Thoumazeau^{2,3}, Samuel Le Gall⁴, Alexis Soiron², Nancy Rakotondrazafy⁵, Annette Bérard⁴, Alain Brauman⁵, Delphine Mézière²

¹UMR SAS, INRAE, Agrocampus Ouest, 65 rue Saint-Brieuc, 35042 Rennes, France

²UMR ABSys, Univ. Montpellier, CIHEAM-IAMM, CIRAD, INRAE, Institut Agro, Montpellier, France

³CIRAD, UMR ABSys, F-34398 Montpellier, France

⁴UMR EMMAH, INRAE, Avignon Université, 228 route de l'Aérodrome, Domaine Saint-Paul – Site Agroparc, CS 40509, 84914, Avignon Cedex 9, France

⁵UMR Eco&Sols, Univ. Montpellier, INRAE, CIRAD, IRD, Institut Agro, Bâtiment 12, 2 Place Viala, 34060, Montpellier Cedex 2, France

Introducing tree rows within temperate crop fields is considered as a lever to intensify ecosystems services; such systems are defined as alley cropping agroforestry. The potential benefit of these systems for enhancing soil's functions is rarely studied. Here, we investigate soil health heterogeneity in temperate alley cropping agroforestry systems according to two factors: the position relative to the tree row (at the tree row; at 0.5 m from the tree row in the crop alley; at 6.5m from the tree row in the middle of the crop alley), and tree species with contrasted functional traits that might influence local microclimate (*Pyrus communis*, *Fraxinus* sp. and *Acer monspessulanum*). The study was performed in one of the few mature and species-diverse agroforestry systems in Europe (Domaine de Restinclières, Southern France; 25-year-old trees). Soil health was assessed using two integrative methods: Biofunctool®, that evaluates the three essential soil functions (i) structure maintenance (ii) carbon transformation and (iii) nutrient cycling; and MicroResp™, that enables to analyse the activity of soil's microbial catabolic profiles. The position relative to the tree row explained most of the soil health differences. The highest soil health scores were found in the tree row, whilst both positions in the crop alley had similar soil health scores. Tree species impacted soil carbon dynamics and microbial catabolic profiles only. This study confirmed the clear effect of the position relative to the trees observed in other recent studies while it highlighted the role of trees in helping to engineer ecosystems. Higher impact is even expected when considering other specific species as nitrogen fixing trees. Thus, this study underlines the importance of considering spatial organization and tree species choice to optimize soil ecosystem services within temperate agroforestry plots.