Agroforestry in viticulture: reducing pesticides and pests while enhancing productivity and profitability?

Papa Boure Ndiaye*[1,2], Adeline Alonso Ugaglia*†[3,4], Jean-Marie Cardebat*[5,6], Adrien Rusch*[4,7], Alex Stemmelen*[8], and Thomas Costes*[1]

[1]UMR 1065 Santé et Agroécologie du Vignoble – INRAE Bordeaux-Nouvelle Aquitaine, UMR1065 SAVE, 33140 VILLENAVE D'ORNON – France

[2]Bordeaux sciences économiques – Université de Bordeaux (Bordeaux, France) – France

[3]UMR 1065 Santé et Agroécologie du Vignoble – INRAE Bordeaux-Nouvelle Aquitaine, UMR1065 SAVE, 33140 VILLENAVE D'ORNON – France

[4]Bordeaux Sciences Agro [Gradignan] – Bordeaux Sciences Agro, UMR SAVE, 1 cours du Gal De Gaulle 33175 Gradignan Cedex – France

[5]Bordeaux Sciences Economiques – Université de Bordeaux (Bordeaux, France) – France

[6]Institut des hautes études économiques et commerciales — School of Business and Economics – OMNES RESEARCH CENTER – France

[7]UMR 1065 Santé et Agroécologie du Vignoble – INRAE Bordeaux-Nouvelle Aquitaine, UMR1065 SAVE, 33140 VILLENAVE D'ORNON – France

[8]UMR 1065 Santé et Agroécologie du Vignoble – INRAE Bordeaux-Nouvelle Aquitaine, UMR1065 SAVE, 33140 VILLENAVE D'ORNON – France

Abstract

Agroforestry is increasingly considered as a sustainable alternative to pesticide use for managing vineyard pests while providing multiple ecosystem services. However, few economic studies have assessed the actual benefits of these services in viticulture. This research aims to analyse the extent to which natural regulation induced by agroforestry practices can mitigate pest-related losses and enhance vineyard profitability. To this end, we studied 40 vineyard plots, both conventional and organic, located in the Nouvelle-Aquitaine region of France. Data were collected between 2018 and 2023 as part of the Bacchus Territorial Innovation Laboratory (LIT). Our methodology integrates a spatial econometric approach applied to panel data, combined with Geographic Information Systems (GIS) to map agroforestry practices around vineyard plots, including hedgerows, grasslands, shrubs, and woodlands. The objective is to assess their impact on grape yield, pesticide expenditures, and the time spent managing pests. Preliminary results indicate that pests have a non-significant effect on grape production, whereas the interaction between agroforestry practices and pest pressure, as well as the interaction between the insecticide treatment frequency index and pests, has a positive and significant effect on yield. These results indicate that agroforestry practices can provide pest regulation services comparable to those of pesticides, reinforcing their potential as an environmentally friendly pest control strategy. They call for support for agroforestry as a means of reducing pesticide use, despite policies that limit its funding, such as budget

*Speaker

†Corresponding author: adeline.ugaglia@agro-bordeaux.fr

cuts for hedgerows. However, we have observed a continuous decline in yields over the years, with this decrease being more pronounced in organic farming than in conventional farming. The yield level in organic farming is 26.5% lower than that of conventional farming, highlighting the climatic and sanitary challenges faced by viticulture and the need to rethink the agricultural system.

Keywords: Agroforestry, natural pest regulation, economic value, damage function, viticulture, spatial econometrics, GIS.