



## **The soils of Champaign are still alive. An assessment of socio-ecological co-evolution in viticulture using DPSIR framework.**

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Conventional agricultural practices have led to a loss of ecosystem services, such as soil fertility and soil integrity, water quality, and carbon storage. The importance of soil health to sustain agriculture in the future has raised sociological and political awareness. Wine growers in the Champaign have been the top one users of pesticides in France, and soils were declared by media “being dead” in the 1980ies. Using the DPSIR framework (Driving forces, Pressure, State, Impact, Response circle) we show the mechanism for the evolution of practices in viticulture between 1990 and 2010 in this region. The observed change from 90% to 33% conventional pesticide use is the result of the interaction between scientists and stakeholders via impact studies and technical advices, thereby modulating socio-economic driving forces. Until 1995, 100% of newly planted vineyard were subjected to fumigation by nematicides which represented the highest pressure in Champaign observed through the negative impact on Lombricidae biomass and diversity as well as on aging of vine. In response, a first warning message was published in 1993 in the Professional Technical Guide for Champaign’s Viticulture followed by systematic yearly recommendation of alternative practices, such as 3 years of fallow before plantation. The increased fear of economic losses for vine farmers drove the nematicide treatment gradually down to 1% in 2010. The restoration of the soil’s biological activities was observed progressively since 2000, associated to an improvement in ecosystem services. The assessment of Champaign’s viticulture show, how studying and communicating indicators within a DPSIR framework at a regional scale allow for a directed evolution of management measures in socio-ecosystems.