Modeling link complexity between crop yield, ecosystem services and multiple landscape representations in the Coteaux de Gascogne region

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Abstract

What is the relative influence of landscape and agricultural practices on crop yield? Are landscape effects on yield explained by an indirect effect on biodiversity and ecosystem services such as predation of pests? Which representation of the landscape is most relevant to explain these effects?
We will attempt to answer these questions from a dataset collected in the Vallées et Coteaux de Gascogne by implementing a Path Analysis (PLS-PM, following Sanchez 2013). Twenty plots of straw cereals were measured for various aspects of yield, pollination and predation services, and bird and plant diversity. A compendium of phytosanitary practices has been produced. Four types of representations were used to describe the landscape structure: land use, spatial variations of the vegetation index derived from hyperspectral images, LIDAR data, and the ecological landscape, as perceived through bird communities.

PLS-PM is one of the many statistical methods for combining multiple blocks in a single analysis. Like Puech et al (2015) or Quinio et al (2017) among others, we will highlight the contributions of this statistical approach to landscape ecology, and some limitations.

References

Puech et al (2015) Landscape Ecol 30:125–140

Quinio et al (2017) Europ. J. Agronomy 82 (2017) 134–143
Sanchez G. (2013) http://www.gastonsanchez.com/PLS Path Modeling with R.pdf

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