



Modelling the interactions between global biodiversity and agricultural land-use

Charlotte Outhwaite (1), Andrea Monica Ortiz (2), Carole Dalin (2), and Tim Newbold (1)

(1) Centre for Biodiversity and Environment Research, Department of Genetics, Evolution and Environment, University College London, London, UK, (2) Institute for Sustainable Resources, Bartlett School of Environment, Energy and Resources, University College London, London, UK

Land-use change – cropland expansion or intensification – is necessary to meet the food demand of an increasingly large and wealthy population, and it is one of the largest threats to biodiversity. Agricultural systems are dependent on the ecosystem services that biodiversity provides, including pollination, natural pest control and nutrient cycling. While intensively farmed croplands have generally low levels of biodiversity, other farming systems may have a synergistic relationship with biodiversity; for example, it has been shown that biodiversity can have positive effects on yield. It is possible that factors such as the type of crop, its yield, and the proximity of the cropland to areas of primary vegetation have effects on local species richness and abundance within an agricultural system.

Understanding and modelling the relationship between global biodiversity and agricultural land-use intensity will help to characterise the drivers of biodiversity change in agricultural systems, and the synergies and trade-offs that result. While recent work has provided direct metrics of the impacts of food production on biodiversity, including the effects of trade, models need to be improved to provide accurate global-scale indicators.

We develop a statistical model using high-resolution global biodiversity, vegetation, and crop yield datasets to analyse the current impacts of agricultural land uses on biodiversity. Biodiversity estimates and associated agricultural land-use intensity from the PREDICTS project, crop yield and production data from Earthstat, and forest cover data from Global Forest Change are used to test the following two research questions: (1) Does proximity to primary vegetation result in greater local biodiversity of agricultural areas at a global level? and (2) What is the current global relationship between crop yield and local biodiversity?