Geophysical Research Abstracts
Vol. 19, EGU2017-8378, 2017
EGU General Assembly 2017

Analysis and prediction of pest dynamics in an agroforestry context using Tiko'n, a generic tool to develop food web models

Marcela Rojas (1), Julien Malard (1), Jan Adamowski (1), Jaime Luis Carrera (2), and Raúl Maas (2)

(1) Department of Bioresource Engineering, McGill University, Montreal, Canada, (2) Instituto de Investigación y Proyección sobre Ambiente Natural y Sociedad (Iarna), Universidad Rafael Landívar, Guatemala, Guatemala (red_iarna@url.edu.gt)

While it is known that climate change will impact future plant-pest population dynamics, potentially affecting crop damage, agroforestry with its enhanced biodiversity is said to reduce the outbreaks of pest insects by providing natural enemies for the control of pest populations. This premise is known in the literature as the natural enemy hypothesis and has been widely studied qualitatively. However, disagreement still exists on whether biodiversity enhancement reduces pest outbreaks, showing the need of quantitatively understanding the mechanisms behind the interactions between pests and natural enemies, also known as trophic interactions. Crop pest models that study insect population dynamics in agroforestry contexts are very rare, and pest models that take trophic interactions into account are even rarer. This may be due to the difficulty of representing complex food webs in a quantifiable model. There is therefore a need for validated food web models that allow users to predict the response of these webs to changes in climate in agroforestry systems.

In this study we present Tiko'n, a Python-based software whose API allows users to rapidly build and validate trophic web models; the program uses a Bayesian inference approach to calibrate the models according to field data, allowing for the reuse of literature data from various sources and reducing the need for extensive field data collection. Tiko'n was run using coffee leaf miner (Leucoptera coffeella) and associated parasitoid data from a shaded coffee plantation, showing the mechanisms of insect population dynamics within a tri-trophic food web in an agroforestry system.