Coffee agroecosystems, ecological functioning of the landscape, and biodiversity: Costa Rica (1980-2014)

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Abstract

The impact of agricultural systems on biodiversity conservation is becoming a relevant issue, due to the worrying biological richness worldwide decrease. Depending on the farming management system, agroecosystems can contribute to increase or reduce this biodiversity. In this paper, we analyze the impact of agricultural systems on the landscape ecology and the maintenance of biodiversity, with particular emphasis on coffee-agroecosystem, choosing Costa Rica as a case study, due to the global importance of this country in environmental conservation. As a methodological approach, we present an intermediate disturbance-complexity model (IDC) that explain how landscape processes are affected by different levels of anthropogenic disturbances on ecosystems when farmers alter net primary production (NPP) through land-use change. The results show the importance of the effective management of forest areas and their ecological connectivity to conserve biodiversity in Costa Rica (land-sparing), but also the negative influence of industrial agriculture based on non-renewable external inputs, as well as the loss of a functional structure of the landscape where coffee agroecosystems should play a fundamental role (land-sharing). While Costa Rica was gaining and consolidating a significant network of natural parks of worldwide renown, the eco-landscape connectivity loss has tended to isolate those biodiversity reserves within the territorial matrix of the country.

Keywords: Disturbance Ecology, Land-use Change, Land matrix heterogeneity, Biodiversity, Coffee Agroecosystem.