

Land use intensification affects the relative importance of climate variation and active land degradation: convergence of six regions around the world

María E. Sanjuan¹, Jaime Martinez-Valderrama², Alberto Ruiz¹, and Gabriel del Barrio¹

¹Estacion Experimental de Zonas Aridas

²Universidad de Alicante

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Abstract

We explored the relative importance of climate oscillations and human-driven disturbances on the change of vegetation biomass in agroecosystems, and whether it is associated with land use. The study was carried out in the drylands of the Iberian Peninsula, NW Maghreb, Palestinian West Bank, Mozambique, China and NE Brazil, using satellite time-series and the corresponding climate fields, at ten-year observation periods with spatial and temporal resolutions of 1000 m (250 m in Palestine) and one year, respectively. For each region, we separated the relative weights of climate and time by fitting multiple-stepwise regressions to a vegetation index as the dependent variable, and annual aridity (Aridity) and year number (Time) as predictors. The relative strength of the resulting standard partial regression coefficients was then compared by the Wilcoxon Signed Ranks test, and their combined associations with land uses were determined using chi-square tests. Some points of convergence are: 1. The relative weights of Aridity and Time depend on particular regional conditions and can be determined. 2. Such weights are associated with land use intensification, such that if vegetation increases over Time, Aridity increases its relative importance with intensification; if vegetation is degrading, Aridity is always more important than Time. 3. Aridity is an indicator of vulnerability to climate warming. Resilience can be improved by reducing land use intensification. 4. Vulnerability may worsen under constant climate if agriculture is intensified. These patterns enhance an integrated understanding of Sustainable Development Goals Indicator 15.3.1, particularly its land cover and productivity trend components.

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