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The relationships among biotic and abiotic factors as control soil degradation processes along a Mediterranean pluviometric gradient.

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The shifts to soil properties that resulted from changes in water availability along a pluviometric gradient from humid to semiarid/arid Mediterranean climate were analyzed. The study was carried out at eight experimental sites in southern Spain and assessed the influence of a reduction in annual average rainfall along the pluviometric gradient on various physical, chemical and hydrological properties of the topsoil, and on the biotic characteristics of the environment. The aims were to assess the soil degradation status, and to determine if any of the soil variables studied could be used as soil degradation indicators. For each experimental site the relationships among a series of edaphic, hydrological and biological properties were investigated, and the principal factors affecting soil degradation were determined using principal component analysis. The properties included the clay, silt and sand content; organic matter; retained organic carbon; salinity; cation exchange capacity; structural stability; USLE K factor; bulk density; saturated hydraulic conductivity; soil moisture; the number of vegetal species; and vegetation cover.

The results showed that relationships between biotic and abiotic factors controlled the soil degradation status along a pluviometric gradient from wet to semiarid/arid conditions in the Mediterranean area, and therefore the stability of the eco-geomorphological system depends on the dominant factor. A precipitation-based soil degradation threshold of approximately 500 mm/yr was established, as below this level the vegetation is no longer associated with the presence of greater soil moisture content, but adapts to degradation, as evidenced by the appearance of xerophytic species.