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Stability and Sustainability in the grazing-vegetation-erosion syndrome in the semi-arid Western Mediterranean

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Previous papers by the author have attempted better to understand the grazing-erosion-vegetation interactions by the study of historical cases, and by the analysis of competitive interactions between vegetation and erosion for soil moisture. They have also examined the interactions in an environment undergoing stochastic variations and analysed the emergence of bare spots in undifferentiated vegetation covers subject to grazing.

In this paper the methodology of Gutierrez et al. is used to examine the grazing-vegetation syndrome in a multi-level trophic web, with man as the top predator and with an actual historical rainfall series exhibiting overall decline and el Nino-type oscillations. The resource base (vegetation) is driven by climate fluctuations using an ecological-optimality approach. Harvesting by herbivores is modelled using a supply/demand ratio approach. As in the Gutierrez-Regev procedure, the top-level search is constrained by economic parameters.

The model is solved by digital simulation for spatial and temporal outcomes for conditions in the Western Mediterranean.