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Forest land suitability in a Mediterranean area under climate change scenarios

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As a consequence of the increasing level of atmospheric CO_2 and air temperatures, global climate is changing leading to warmer and often drier conditions in many forest ecosystems. The Mediterranean area is particularly vulnerable to climate change as a result of a combination of environmental and human factors. An adequate forest management is associated to improvement of habitat suitability for soil and water quality, climate regulation and other important ecosystem services. The MicroLEIS decision support system (*MicroLEIS DSS),* through its 12 land evaluation models, is a useful tool to assist decision-makers with specific agro-ecological problems. Among the land evaluation models, *Sierra* was specifically designed to assess forestry land suitability for restoration of semi-natural habitats in marginal agricultural lands. This model selects up to 22 forest species adapted to Mediterranean conditions based on latitude, longitude, physiographic position, useful depth, texture, drainage, pH, summer and winter temperatures, and precipitation. In this research, *Sierra* model was applied in 35 benchmark sites representative of the natural regions (NUTS2) of a Mediterranean area (Andalusia, Southern Spain) in current and future climate scenarios for the A1B IPPC SRES (Special Report on Emission Scenarios) and the periods 2040, 2070 and 2100. Data was obtained from SEISnet soil database, CDBm climate database and the future climate change variation values of the State Meteorological Agency. The results showed that *Pinus Pinea, Pinus halepensis, Quercus Ilex* and *Quercus suber* are the most suitable forest species in actual and future climate scenarios for the selected marginal lands, according to the tolerance ranges for standard soil and climate variables of the forest species. Various forest species showed a potential aptitude for reforestation in future climate scenarios (i.e. *Quercus*), whereas others such as *Castanea Sativa* will not be suitable in the study area in 2070 and 2100. The methodology applied in this study can be used in other Mediterranean areas with available data on soil, site and climate factors. This study might help decision-makers to establish and improve polices for climate adaptation of forest ecosystems (UN-REDD and REDD+) and to facilitate the implementation of European plans such as the EU Forest Strategy, the 2020 Biodiversity Strategy and the Soil Thematic Strategy.

Keywords: Ecosystem services, MicroLEIS DSS, global change, forest policies, climate regulation, land suitability.