



Climate change adaptation via targeted ecosystem service provision: a sustainable land management strategy for the Segura catchment (SE Spain)

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Topical research investigating climate, land-use and management scenarios in the Segura catchment (SE Spain), depicts a landscape at high-risk of, quite literally, deserting agriculture. Land degradation in the semi-arid region of SE Spain is characterized by water shortage, high erosion rates and salinization, increasingly exacerbated by climatic changes, scarce vegetation cover and detrimental farming practices. Future climate scenarios predict increases in aridity, variability and intensity of rainfall events, leading to increasing pressure on scarce soil and water resources. This study conceptualized the impending crisis of agro-ecological systems of the Segura basin (18800 km²) as a crisis of ecosystem service deterioration. In light of existing land degradation drivers and future climate scenarios, the potential of Sustainable Land Management (SLM) strategies was evaluated to target three priority ecosystem services (water provision, sediment retention and carbon sequestration) as a means to achieve climate change adaptation and mitigation. A preceding thorough process of stakeholder engagement (as part of the EU funded DESIRE project) indicated five SLM technologies for potential implementation, all with a focus upon reducing soil erosion, increasing soil water holding capacity and soil organic matter content. These technologies have been tested for over four years in local experimental field plots, and have provided results on the local effects upon individual environmental parameters. Despite the growing emphasis witnessed in literature upon the context-specificity which characterizes adaptation solutions, the frequent analysis at the field scale is limited in both scope and utility. There is a need to investigate the effects of adaptive SLM solutions at wider, regional scales. Thus, this study modeled the cumulative effect of each of the five selected SLM technologies with InVEST, a spatial analyst tool designed for ecosystem service quantification and valuation. Scenario impacts upon the three prioritized ecosystem services were evaluated under present and expected future climate conditions (IPCC A1B scenario storyline for 2050) using ensemble regional climate model predictions. Results are given for both the entire Segura catchment as well as for delineated sub-catchments. This study's value lies in providing relevant stakeholders with quantitative information upon which SLM strategies result in greatest ecosystem service provision and tradeoffs, and thus greatest resilience to expected climate change impacts. Furthermore, this research hopes to contribute towards the mainstreaming of the ecosystem services concept in land management policy and research, and thus to familiarize relevant stakeholders with the concept, facilitating scaling-up processes by communicating the necessity and a means to successfully achieve climate adaptation.