Geophysical Research Abstracts
Vol. 19, EGU2017-15788, 2017
EGU General Assembly 2017

Sustainable Land Management's potential for climate change adaptation in Mediterranean environments: a regional scale assessment

Joris P.C. Eekhout and Joris de Vente

Soil and Water Conservation Research Group, Spanish National Research Council (CEBAS-CSIC), Murcia, Spain (Jeekhout@cebas.csic.es)

Climate change has strong implications for many essential ecosystem services, such as provision of drinking and irrigation water, soil erosion and flood control. Especially large impacts are expected in the Mediterranean, already characterised by frequent floods and droughts. The projected higher frequency of extreme weather events under climate change will lead to an increase of plant water stress, reservoir inflow and sediment yield. Sustainable Land Management (SLM) practices are increasingly promoted as climate change adaptation strategy and to increase resilience against extreme events. However, there is surprisingly little known about their impacts and trade-offs on ecosystem services at regional scales. The aim of this research is to provide insight in the potential of SLM for climate change adaptation, focusing on catchment-scale impacts on soil and water resources.

We applied a spatially distributed hydrological model (SPHY), coupled with an erosion model (MUSLE) to the Segura River catchment (15,978 km2) in SE Spain. We run the model for three periods: one reference (1981-2000) and two future scenarios (2031-2050 and 2081-2100). Climate input data for the future scenarios were based on output from 9 Regional Climate Models and for different emission scenarios (RCP 4.5 and RCP 8.5). Realistic scenarios of SLM practices were developed based on a local stakeholder consultation process. The evaluated SLM scenarios focussed on reduced tillage and organic amendments under tree and cereal crops, covering 24% and 15% of the catchment, respectively.

In the reference scenario, implementation of SLM at the field-scale led to an increase of the infiltration capacity of the soil and a reduction of surface runoff up to 29%, eventually reducing catchment-scale reservoir inflow by 6%. This led to a reduction of field-scale sediment yield of more than 50% and a reduced catchment-scale sediment flux to reservoirs of 5%. SLM was able to fully mitigate the effect of climate change at the field-scale and partly at the catchment-scale. Therefore, we conclude that large-scale adoption of SLM can effectively contribute to climate change adaptation by increasing the soil infiltration capacity, the soil water retention capacity and soil moisture content in the rootzone, leading to less crop stress. These findings of regional scale impacts of SLM are of high relevance for land-owners, -managers and policy makers to design effective climate change adaptation strategies.