

Climate and land use change impacts on agroecosystem services and biodiversity – risks of maladaptation?

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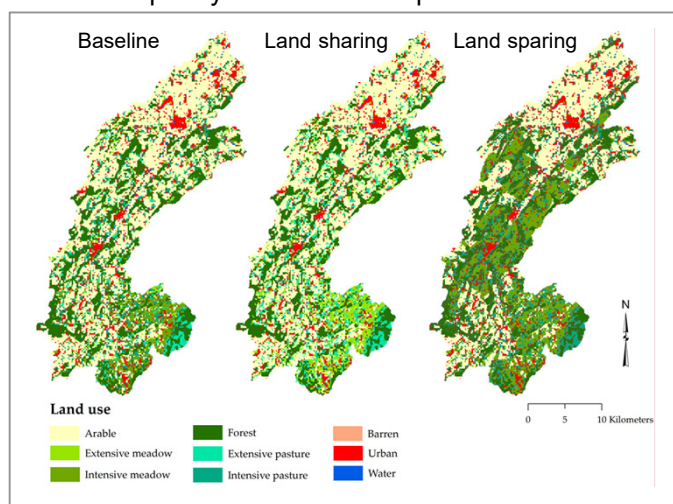
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Background

Climate and land use change are key drivers of ecosystem service provision. Depending on land management strategies, adverse impacts of climate change may be aggravated or alleviated. In this study, we evaluated impacts of climate change considering two alternative land management strategies (i.e. land-sparing vs. land sharing).

Approach

1. Participatory scenario development



2. Integrated model evaluations

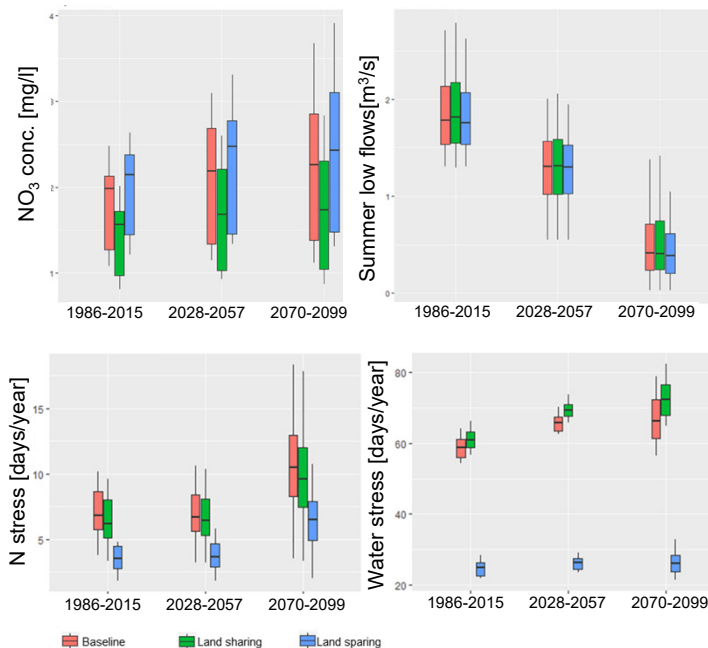
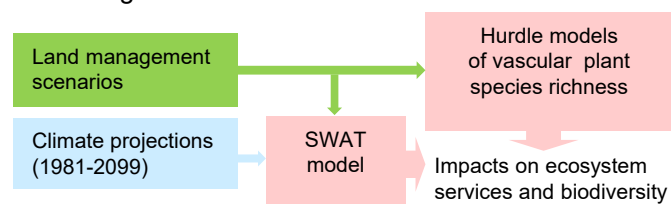


Fig. 1: Average ecosystem service indicator values for three land use scenarios and three climate periods; boxplots indicate uncertainty distributions (parameterization and climate projection uncertainty).

Results

Results indicate that climate change is likely to reduce summer low flows, increase nitrate concentrations, and increase water and nutrient stress limitations to crop productivity. In interaction, management changes have marginal effects on low flow, but induce considerable variation in nitrate concentrations in the river as well as water and nutrient limitations in crop growth (Fig.1). Also, vascular plant species richness is strongly influenced by changes in management.

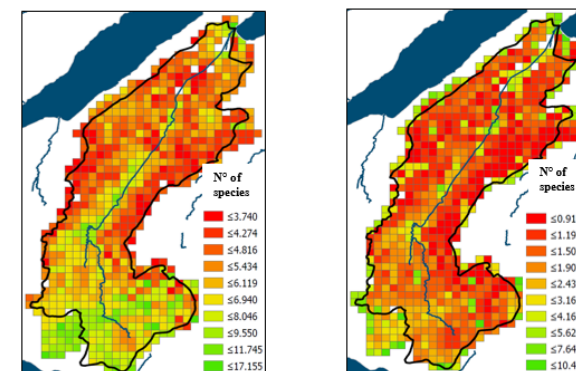


Fig.2: Vascular plant species richness for land sharing (left) and land sparing (right) within the study region (Bussani 2017).

Key findings

The results of this project indicate that the conflict between agricultural productivity and resource conservation will intensify under climate change. Land sparing could reduce water and nutrient stresses to crop productivity under climate change, but at the expense of increase nitrate pollution and biodiversity losses. To reduce such trade-offs, targeted measures to improve water and nutrient use efficiency are needed.

Find more details in:

Zarrineh et al. 2020. Integrated assessment of climate change impacts on multiple ecosystem services in Western Switzerland. *Sci. Total Environ.* 708, 135212.

Zarrineh et al. 2018. Model-Based Evaluation of Land Management Strategies with Regard to Multiple Ecosystem Services. *Sustainability* 10, 3844-3844.

Bussani, L., 2017. Grassland biodiversity indicators in the Western Swiss Plateau - Modelling possible impacts of climate vs. management changes, OCCR. University of Bern, Bern, p. 59. (MSc thesis)