
Trade-offs and synergies between agro-ecosystem functions in climate change adaptation planning

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Abstract

Climate change poses a major challenge to agricultural production all over the world. In order to sustain agricultural productivity, farmers will have to gradually adapt their management (e.g. by shifting sowing dates, choosing different crops or varieties, intensifying irrigation). In a multifunctional agricultural environment, not only the productivity function is influenced by changes in climate, but also other functionalities such as water availability and quality, soil protection or nutrient cycling. Combined effects of climate and management adaptations may aggravate existing environmental problems or induce new conflicts if adaptation is planned with a sole focus on productivity. An integrated system view is required in order to promote synergistic adaptation efforts accounting for agricultural multifunctionality and preventing environmental degradation.

We present results from the application of a regional multi-objective optimization routine which integrates a biophysical model for the evaluation of climate and management effects on yields, soil loss, nitrate leaching and water consumption for irrigation. For a case study region in Western Switzerland trade-offs between system functionalities are identified and possibilities for balanced compromise solutions are explored, which can be considered as possible goal scenarios of integrated adaptation strategies.

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