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Land use change and agricultural production of a Central European region expected until 2050

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Land use change and agricultural production of a Central European region expected until 2050

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Abstract: Based on a participatory scenario process, we assessed potential land-use trajectories for Central Germany until 2050. The objective was to quantify consequences of large scale drivers such as climate change, as well as regional drivers such as population decline, and changes in regional preferences e.g. concerning bioenergy production, organic agriculture or reforestation as considered by regional stakeholders and scientists during scenario development. Stakeholders were covering a broad range of state and regional scale private and public bodies and NGOs. The spatially explicit and cellular automata based land use model SITE was used to simulate land use change scenarios until 2050. The model was calibrated applying a genetic algorithm for the period 1990 – 2006 and parameterized based on the scenario assumptions for the period 2007 – 2050. Land cover changes indicated moderate to considerable losses of agricultural land, mainly influenced by urbanisation / urban sprawl and reforestation. Our results also suggest that considerable land use changes can be expected in the agricultural sector. Results are showing declining yields of most major crops grown in the region towards 2050. Contrastingly, two of seven crops benefited from future climate conditions. Total agricultural production differed strongly in the four scenarios, ranging from moderate decline to considerable increases until 2050. Thus, the combination of different large scale and regional drivers led to partly unexpected net effects on agricultural production and showed some of the trade-offs to be expected between the different land use and land management trajectories assumed by stakeholders and scientists in the regional scenarios. Results were discussed with the case study advisory board, representing stakeholders from regional to national level bodies and NGOs. As far as technically possible, we adapted the modelling approach in an iterative fashion in accordance to stakeholders' suggestions and recommendations in order to increase relevance and applicability of the results – serving as a basis for further discussions of possible future land cover and management effects.

Keywords: Central Germany; land management; land use modelling; participatory scenarios; spatially explicit model; uncertainty