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# Comparing the effects of climate and impact model uncertainty on climate impacts estimates for grain maize

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Crop models are commonly applied to estimate impacts of projected climate change and to anticipate suitable adaptation measures. Thereby, uncertainties from global climate models, regional climate models, and impacts models cascade down to impact estimates. It is essential to quantify and understand uncertainties in impact assessments in order to provide informed guidance for decision making in adaptation planning. A question that has hardly been investigated in this context is how sensitive climate impact estimates are to the choice of the impact model approach.

In a case study for Switzerland we compare results of three different crop modelling approaches to assess the relevance of impact model choice in relation to other uncertainty sources. The three approaches include an expert-based, a statistical and a process-based model. With each approach impact model parameter uncertainty and climate model uncertainty (originating from climate model chain and downscaling approach) are accounted for. ANOVA-based uncertainty partitioning is performed to quantify the relative importance of different uncertainty sources.

Results suggest that uncertainty in estimated yield changes originating from the choice of the crop modelling approach can be greater than uncertainty from climate model chains. The uncertainty originating from crop model parameterization is small in comparison. While estimates of yield changes are highly uncertain, the directions of estimated changes in climatic limitations are largely consistent. This leads us to the conclusion that by focusing on estimated changes in climate limitations, more meaningful information can be provided to support decision making in adaptation planning – especially in cases where yield changes are highly uncertain.