



The impact of inter-annual rainfall variability on food production in the Ganges basin

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Rainfall variability is expected to increase in the coming decades as the world warms. Especially in regions already water stressed, a higher rainfall variability will jeopardize food security. Recently, the impact of inter-annual rainfall variability has received increasing attention in regional to global analysis on water availability and food security. But the description of the dynamics behind it is still incomplete in most models. Contemporary land surface and hydrological models used for such analyses describe variability in production primarily as a function of yield, a process driven by biophysical parameters, thereby neglecting yearly variations in cropped area, a process driven largely by management decisions. Agricultural statistics for northern India show that the latter process could explain up to 40% of the observed inter-annual variation in food production in various states. We added a simple dynamic land use decision module to a land surface model (LPJmL) and analyzed to what extent this improved the estimation of variability in food production. Using this improved modelling framework we then assessed if and at which scale rainfall variability affects meeting the food self-sufficiency threshold. Early results for the Ganges Basin indicate that, while on basin level variability in crop production is still relatively low, several districts and states are highly affected (RSTD > 50%). Such insight can contribute to better recommendations on the most effective measures, at the most appropriate scale, to buffer variability in food production.