Agricultural adaptation to climate change – Are there risks of increasing water use conflicts?

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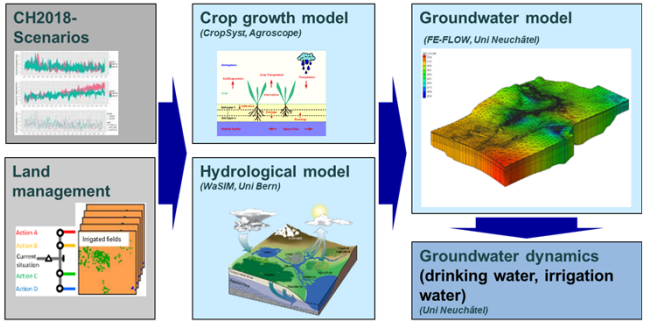
Background

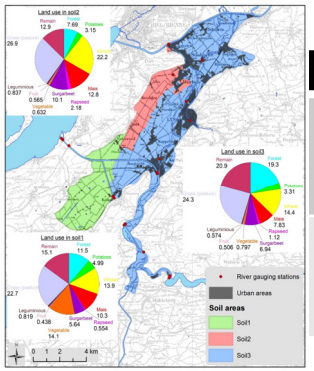
Climate change is altering agricultural production conditions. Possible adaptations have implications on water use. Thus, water use conflicts may emerge. An integrated modelling framework was applied here to evaluate joined impacts of climate and management changes on groundwater resources.

Approach

Integrated modelling framework



Land management scenarios



Scenarios	Description
#3 extreme intensification	100% irrigated vegetable in soil zone 1
#4 extreme extensification	100% rain-fed grassland in soil zone 1

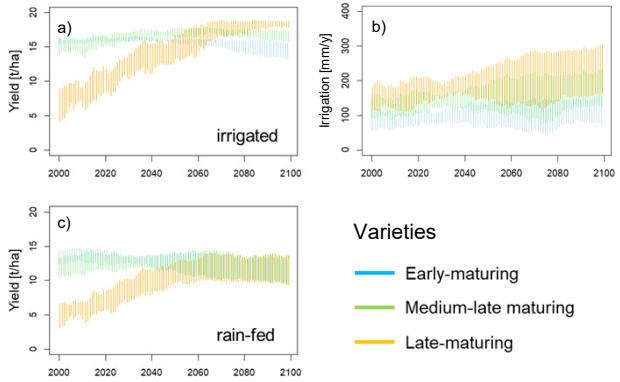


Fig. 1: 20-year sliding averages of simulated grain maize yields (a = irrigated, c = rain-fed) and seasonal irrigation demands (bar lengths indicate prediction uncertainties) for three varieties.

Key findings

- Temperature-adapted varieties might benefit from warming, but require larger amounts of irrigation water
- With varietal adaptation, irrigation water demand may increase by up to 80% compared to 40% or less without adaptation
- Heavy intensification of irrigation water use would lead to a seasonal reduction in groundwater levels by 1.5m on average and 3.5m in an extreme dry year
- Possible negative implications need to be evaluated in future studies

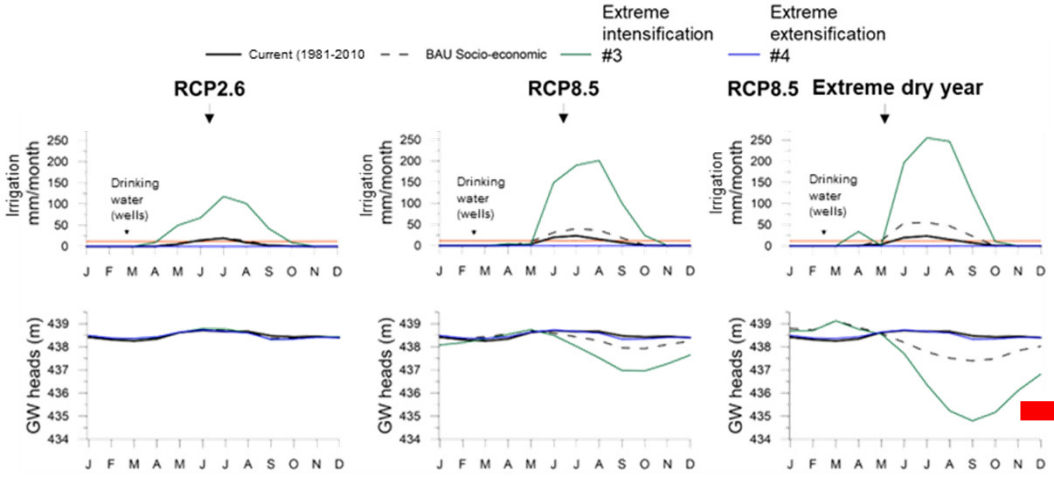


Fig. 2: Simulated mean monthly irrigation and groundwater heads under climate change (2070-2099, RCP2.6, RCP8.5) for land management scenarios in comparison to baseline (1981-2010).

Increased pumping costs?

Groundwater quality?

Biodiversity in ecosystems relying on stable groundwater heads?

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