Agricultural adaptations to increasing drought extremes and their feedbacks on catchment hydrology

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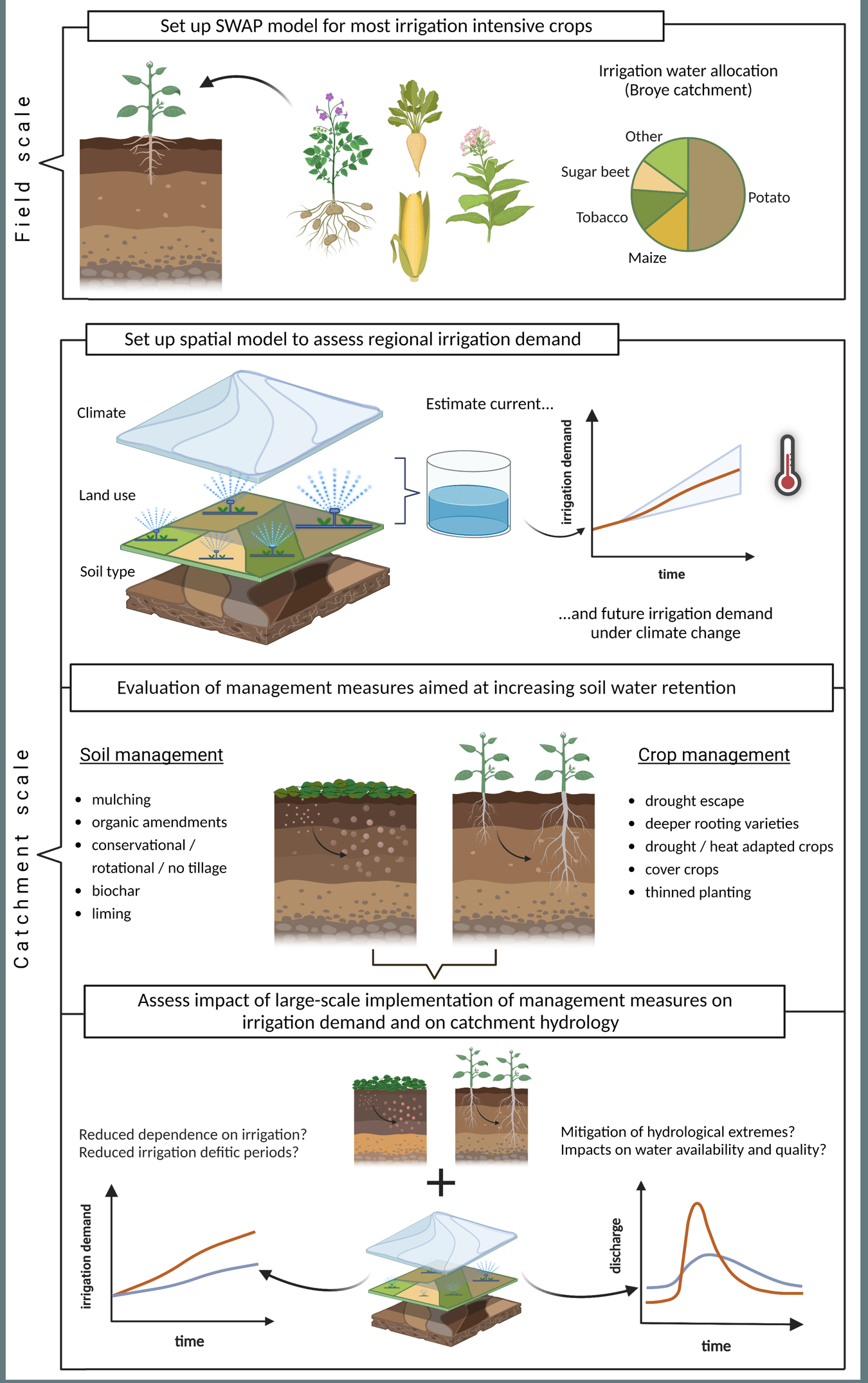


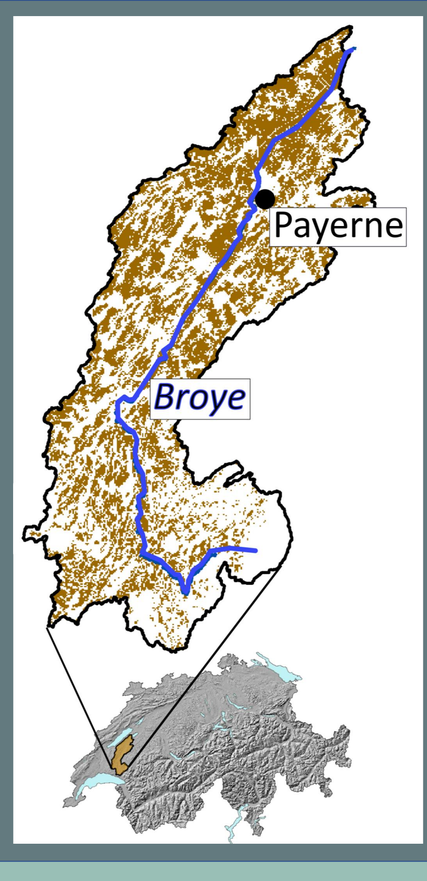
1 Introduction

Rising temperatures and changing precipitation patterns will increase the need for irrigation in the future, while lower summer and autumn streamflow will reduce water availability when most needed (Holzkämper et al. 2020; FOEN 2022). With increased water use conflicts and summer irrigation bans, approaches are needed to reduce irrigation demand. In this context, we ask ourselves the following research questions:

- What is the current and future irrigation demand? When did irrigation deficits occur in the past?
- What management measures can reduce irrigation demand and prevent drought-related yield losses?
- How do management measures impact the hydrological cycle on catchment-scale?
- How can we couple a field-scale agrohydrological model (SWAP) and a meso-scale hydrological model (mHM) to assess these impacts?

2 Study area

The mid-sized Broye catchment is dominated by agricultural land use, here shown in brown (BLW 2018). The region is often affected by irrigation bans in summer (Zarrineh et al. 2018; FOEN 2021).



3 Methods

The soil-water-atmosphere-plant (SWAP) model is parameterized for irrigation-intensive crops and then spatially applied to subregions with the same climate, soil, and land use. Different agricultural practices are included in the model and their impacts on irrigation demand today and in the future under climate change are assessed. SWAP will be coupled with the mesoscale hydrologic model (mHM) to evaluate how changes in local management affect hydrologic responses in the catchment.

4 Targeted outcomes

→ Current and future irrigation demand is quantified

→ One or more management measures to decrease reliance on irrigation are identified

→ Impacts on the hydrologic cycle, like the mitigation of hydrologic extremes are assessed

→ A routine to couple SWAP and mHM is defined

References

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