▶ Project *brief*

Quantification of Regional Irrigation Demands for Agriculture in Bavaria

Jacob Jeff Bernhardt[1], Lennart Rolfes[1,2], Martin Henseler[1,3], Peter Kreins[1]

- The ongoing climate change will pose major challenges for German agriculture in the future and require well thought-out water management adaptation strategies.

- In this study, the irrigation demands of Bavarian agriculture are simulated for the periods 1991–2020 (ex-post period) and 2021–2050 (future)

- By 2050 the mean annual water demand for irrigation in Bavaria is expected to increase by 19 %

Background and aims

Changes in the monthly water balance and precipitation depths, their intra-annual shift in favor of the winter half-year, as well as increasing evaporation rates, indicate that water is a limited production factor. These global changes can also be considered on a regional scale and are consequently also of high relevance in Germany.

The aim of this project is to develop a model approach that allows for a realistic and area-wide quantification of the future regional irrigation demand for intensive agricultural crops under climate change conditions at the municipal level across Bavaria.
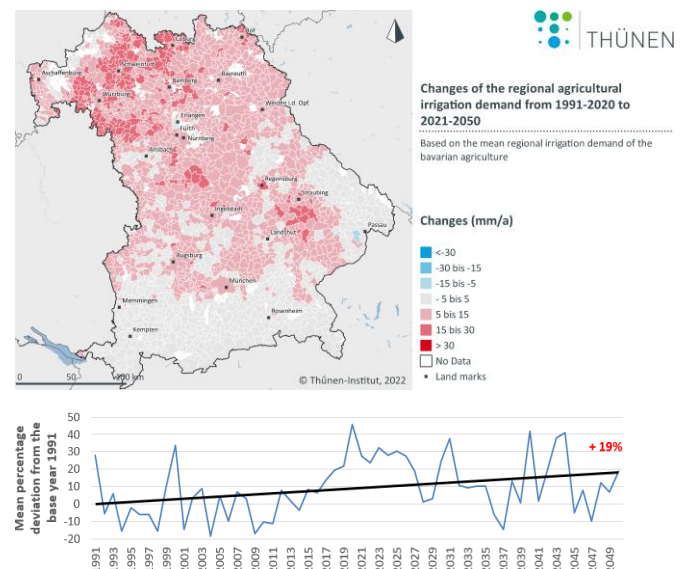
The data basis for the developed model approach is spatial data with a daily temporal resolution. These include: observed climate data (potential evapotranspiration and precipitation), location specific information on soil type or the water storage capacity, as well as land use data. In order to be able to model the climate conditions of the future, regionalized ensemble climate projection data of the German Weather Service for the RCP 8.5 scenario is used. The land use information is linked to crop-specific data. These include the plant coefficient as a value for mapping the crop-specific water demand, growth stages of the crops over the course of the year and the respective soil moisture optimum.

Key findings

Considering all the crops in a Bavaria-wide comparison of the two observation periods, the average irrigation demand rises.

Increases in the mean annual total irrigation demand of 19% are to be expected by the year 2050. Differentiated according to land use classes, Bavaria's irrigation demand will increase by 19% in arable farming, 23% in vegetable growing and 10% in the cultivation of special crops. However, annual fluctuations in climatic conditions can lead to significant deviations from the average trend.

Changes in regional irrigation demand in Bavaria from 1991-2050

Source: Bernhardt et al. 2022 (p. 65)