Securing the agricultural production with additional water demand under altered climate conditions – measures for a sustainable groundwater management as well as recommendations for the agricultural cultivation in the Hessian Reed

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The climate change projected for Hesse will have a great influence on all hydrological parameters. Until 2050 a significant increase in the average annual temperature is predicted. Likewise distinctive increases in winterly precipitation as well as a marked decrease in summerly precipitation are expected. Thus the climate change will have effects particularly on land intensively used for agricultural and horticultural purposes in South Hesse. Under the present climatic conditions in the Hessian Reed an economical plant production is already only possible through additional irrigation.

It is assumed that the demand for additional water in grown cultures during the summer half-year will increase due to the prognosed climate change. Such a development would involve a pronounced increase in additional water demand in plant production. The investigation of alterations relating to additional water demand in agricultural cultures requires the registration of the present irrigation methods. Therefore, the current situation of agricultural irrigation in the Hessian Reed was recorded by a survey.

Relating to the entire agriculturally used area (34 437 hectares) in the Hessian Reed the percentage of accessible irrigation area is 96 %. The survey revealed also that the cultivation of vegetables, strawberries and other garden crops comprises about a fourth of the agricultural area in the Hessian Reed and lies herewith far above the average (3-5 %) of such cultures in the county.

Referring to the irrigation quantities the inquiry revealed that the demand for additional water in “wet years” has increased from 3.5 million m^3 to 10 million m^3 during the last 15 years. This is equivalent with an increase of additional water demand by about 12 l/m^2 within a decade.

On the basis of a continuous time series of the regional climate model WETTREG founded on the A1B scenario the expected developments of temperature, precipitation as well as evaporation from 1960 to 2050 were simulated. These data were taken as a basis for the expected development of additional irrigation.

From available climate data such as precipitation and potential evaporation first the daily water balances were determined by calculating the difference, and then aggregated on a monthly basis. The evaluation revealed that for the months of January, February and March a continuously increasing positive water balance is to be expected. For the months of April, May, June, July and August the water balances will become more and more negative towards the middle of the century.

Referring to the irrigation period (last week in March to the beginning of October) there will be an excess demand for water for agriculture due to the water balances becoming increasingly negative in the future. This deficit raises the additional water demand per decade by about 10 l/m^2.

As in the Hessian Reed the necessary infrastructure for irrigation is available, a growth of „intensive cultures“ (e. g. asparagus, other vegetables and berries) is to be expected with further rising water demand, caused by the climate change.