**Methode**

The catchment's vegetation response to climate and management changes was studied by means of the catchment's evapotranspiration coefficient (kET)



where kET is the catchment evapotranspiration coefficient (mm/mm) and $E\_{act}$ and Tract are the catchment actual soil evaporation and crop transpiration as determined by Eq X (mm). The simulated Eact and Tract have been adjusted to the soil water content and climatic conditions as shown by Eq X and Eq X.

**Resultaten**

**X.X.X Catchment soil water balance and vegetation response**

The observed changes to catchment water availability and various subflows originated from changes to the simulated soil water balance, presented in Table X The increase in total flow under future climatic conditions is due to an increase of total rainfall combined with a small decrease of the rainfall fraction that leaves the catchment through evapotranspiration. Furthermore, deep percolation and surface runoff increased under future climatic conditions, both in relative and absolute terms, which led to the increase in overland flow as well as interflow and baseflow. Also from the soil water balance it is clear that adapted management decreased surface runoff as compared to traditional management, while deep percolation increased.



Although both ETo and evapotranspiration increased for future conditions, the vegetation response to climate change caused a 6.6% decrease of the evapotranspiration coefficient when evaluated over the whole 30-year simulation period. kET decreased from 0.79 under historical conditions to 0.74 under future conditions for both traditional and adapted management. Figure X shows that these kET changes were even more pronounced during summer months with median decreases of between 5 to 10%. For the GFDL-CM3 climate model there was even an increase of about 30% for August. During fall and winter months, when crop transpiration is mostly limited to winter crops, the vegetation response to climate change was negligible (kET decreased by maximum 1%). Despite the fact that adapted management did not affect kET when evaluated over the whole simulation period, it clearly affected monthly kET values. Adapted management partly countered the kET decrease due to climate change for most months, except for April, May and July.

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**Discussion**

**X.X. Implications**

Many lumped conceptual hydrological models could have been used to study the impact of climate change on runoff at the outlet of the Plankbeek catchment. However, AquaCrop-Hydro has the advantage of being more dynamic with respect to the catchment's response behaviour to climatic changes. The soil water balance simulations of conceptual hydrological models under climate change are only affected by changes in rainfall and potential evapotranspiration input, but not by changes to vegetation in the catchment. The relation between actual and potential evapotranspiration remains unaffected by climate change, expect for the soil water balance correction. Consequently, vegetation feedbacks to the hydrological system are completely neglected. By contrast, AquaCrop-Hydro simulates actual evapotranspiration not just based on climatic conditions (ETo) and the soil water balance, but also based on the simulated crop canopy cover. Hence, when climate change causes alterations to the canopy structure, the simulated evapotranspiration will be automatically adjusted. This research showed that the catchment's evapotranspiration coefficient decreased by up to 10% during summer months for future climatic conditions. Since about 65% of the rainfall leaves the Plankbeek catchment through evapotranspiration, conceptual hydrological model make a considerable error when neglecting the vegetation responses to climate change. Especially for accurate simulation of water availability during summer months it is crucial to use a dynamic equation for estimation of evapotranspiration. Van Walsum et al. 2012 already stressed that a static approach like adopted by conceptual hydrological models should be abandoned in favour of a dynamic approach. AquaCrop-Hydro provides an opportunity to do so, without forcing people to switch to complex physically based models with high data and calibration requirements.