An improved drainage management approach to overcome summer drought damage in Nordic agriculture

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PRACTICE ABSTRACT

Author: OULU

www.wateragri.eu

Besides excess water, summer drought is a recurring phenomenon in Nordic agriculture and causes substantial yield losses. Additionally, diffuse nutrient pollution from agriculture, mainly due to poorly managed subsurface drainage systems, is a primary concern for the ecological health of European river basins. The reuse and improved use of drainage water for fertigation through improved drainage control could be an essential strategy to reduce yield losses during summer drought and nutrient loading to surface water. We present a simple, flexible, and eco-friendly approach to reusing drainage water for fertigation through improved drainage control and promoting a circular economy in challenging Nordic conditions.

In the first step of the proposed smart drainage management approach, reference and crop evapotranspiration are calculated using crop coefficient and forecasted climatic data. Then daily soil moisture for the next ten days is calculated using a novel Water Balance Simulation (WBS) and FAO crop water productivity model, AquaCrop, to estimate the field's tentative irrigation and drainage requirement. The water level in the field will be regulated using automatic drainage control with the help of a novel ICT based measuring sensor. Excess drainage water from the field will be stored in the nearby drainage ditch, a buffer pond, or a portable storage tank during excessive rainfall events. Finally, previously-stored drainage water will be reused for fertigation during summer drought. A solar pump will be used to store drainage water in the tank.

A hypothetical experiment was conducted to evaluate our proposed smart drainage management approach to reusing drainage water for irrigation through improved drainage control. For that FAO crop water productivity model, AquaCrop has been used. The result shows that reusing drainage water for irrigation during summer drought can significantly reduce the yield losses during dry seasons. Moreover, the proposed approach will significantly reduce the nutrient loading to surface water from the agricultural field.

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