

Water balance modelling of short rotation poplar plantations

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Ikea Industries Ltd. plan to establish 4.000 ha of new SRP (short rotation plantation) in Slovakia. It is widely known that water supply is the most important site parameters for the poplar hybrids. In drought periods biomass production is lower and if drought takes so long the trees can dry out. The limiting parameter for the plantations is the water storage capacity of the soils (coarse sand) in the land neighbouring the Ikea Industries Ltd. Nevertheless, the impact of climate change (extreme temperature and water shortage) can make the water shortage problem more serious.

Water balance of soil profile was simulated using the HYDRUS 1-D software to test the suitability of site conditions for poplar plantation. Since the model was mainly developed for modelling water balance in non-forest areas, we introduced a new crown interception (INT) submodel as upper boundary condition. We worked with the meteorological data of 2016 and 2017 during modeling. The input of the model was interception reduced potential evapotranspiration (PET-INT) and precipitation (P-INT) as upper boundary condition. Two varieties of sites were analyzed: a two- (sandy loam, sand) and a three-layer (sandy loam, sandy clay, sand) soil profile. For individual soil profiles, two other variants for the lower boundary condition was used: free drainage and constant pressure head.

As a result, we found that the actual transpiration was greater at presence of shallow water table (caused by constant pressure head lower boundary). With surface close sandy clay layer, the water holding capacity of the soil profile became higher so this effect also influenced transpiration rate. Summarizing the results, the most important parameter for poplar plantations are not only the water holding capacity of the soil profile but also the presence of shallow water table.

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