



Long-term water balance for selected crops in agricultural growing areas across the Czech Republic: A web-based crop water requirement calculator

Renata Duffková (1), Jiří Holub (1), Petr Fučík (1), Daniel Žížala (1), Jaroslav Rožnovský (2), and Ivan Novotný (1)

(1) Research Institute for Soil and Water Conservation, Praha 5 - Zbraslav, Czech Republic (duffkova.renata@vumop.cz), (2) Czech Hydrometeorological Institute, Brno, Czech Republic (roznovsky@chmi.cz)

Water balance of arable land determines soil moisture availability for crop planting. Long-term water balance for four selected crops (winter wheat, oilseed rape, silage maize, potatoes) was derived for all agricultural growing areas in the Czech Republic (maize-, beet-, potato- and mountain- growing areas) for the 1981-2010 period, balancing sources of crop available water (precipitation, soil water supply, rising groundwater) and crop water requirements using crop evapotranspiration (FAO 56 method). Computed water balance was divided into four categories using soil hydrolimits and specific crop-soil water availability: categories 1 and 2 with zero or moderate occurrence of crop water stress, categories 3 and 4 with medium and strong occurrence of crop water stress. Growth and development of winter crops was affected by water stress to a lesser extent (the area of categories 1 and 2: wheat 35.4%, rape 45.6%, category 4: wheat 9.7%, rape 5.3%) as compared to spring crops, which suffered from water shortage much more (the land area of categories 1 and 2: maize 19.4%, potatoes 17.4%, category 4: maize 8.3%, potatoes 10%). The highest water deficit was recorded for all crops in the maize-growing area (no category 1, a small extent of category 2 only in case of winter crops) due to low precipitation and high crop water requirements. For all crops, most water available for crops was in mountain-growing area.

Attained findings and the method used were incorporated into a web-based crop water requirement calculator (<https://kalkulacka.vumop.cz/vlaha/?> ; in Czech only), which enables to assess crop water requirements (and potential volumes of irrigation) for selected crop schedules for all field blocks across the whole Czech Republic. Besides this, the presented approach stand for a promising tool for evaluation of regional water balance shifts for selected crops and imply the need of measures towards optimization of water regimes on agricultural land.

Acknowledgment: This work was supported by Czech Ministry of Agriculture, project no. QK1720285 „New methods for adjustment of altered crop water requirements in irrigation systems across Czechia as affected by soil and climate changes“