Calculation of water deficit

Water deficit/surplus for given crops is based on the Czech technical norm (ČSN 750434). The norm uses standardized temperatures (***ST***) according to the long term averages. For these standardized temperatures were devoted to optimal rainfalls (***OR***). These optimal rainfalls (in mm) are stated for the vegetation period (April - October) and they represent the sum of monthly rainfalls that ensure maximal yield for given commodities.

Table S1. Water requirements calculation

Line	Crop/Item/Month	Unit
1	Temp Standard (***TS***) (table L1, ČSN 750434)	°C
2	Observed temperature (WWW.CHMI.CZ)	°C
	Rounded to the whole numbers (***ROT***)	°C
3	Temparature difference (***td***)(Line2 - Line1)	°C
4	Optimal rainfalls (HEMERKA, In: ČSN 750434)	mm
5	Adjustment[1)] for OR (***aor***) (norma ČSN 750434)	mm
6	Adjusted OR (***AOR***) (Line5 + Line 4), Correspond with water requirement (WR)	mm
7	Observed rainfalls (CHMI.CZ)	mm
8	Deficit d (-) / excess water e (+) (Line7 - Line6)	mm

Note:

1) For each +1°C above the temperature standard are OR increased by 5 mm, and the opposite for each -1°C below the temperature standard are OR decreased about 5 mm.

Source: Authors based on ČSN 750434, STR. 40, PŘÍLOHA L (TS, OR) and CHMI, 2018, online 2020.

Table S2. Temperature standards

Month	IV	V	VI	VII	VIII	IX	X
Normal Temperature (°C)	9	14	17	19	18	14	12

Source: ČSN 750434

The obtained results can be negative values when there was recorded the water surplus, or positive if there was a lack of rainfall and water deficit was calculated.

Water deficit (***DW*** in mm) is the sum of water deficits for observed months (***d***) in the given year. Water surplus (***s***) in one month can affect the water balance in the following month, thus the rainfalls above the stated OR are transferred do the next month in max. value of |30|mm (ČSN 75 0434). Then the DW is multiplied by the size of the harvest area (***A***).

The water deficit (DW) is calculated according to the following formulas:

$$DW = WB * A$$

Where: *DW = water deficit, WB = water balance, A = harvest area of a given crop*

$$WB = r - AOR$$

Where: *WB = water balance, r = observed rainfalls for given period, AOR = Adjusted optimal rainfalls*

$$AOR = aor + OR$$

Where: *AOR = Adjusted optimal rainfalls, aor = adjustment for optimal rainfalls, OR = optimal rainfalls*

$$aor = td * 5$$

Where: *aor = adjustment for optimal rainfalls, td = temperature difference between optimal and observed values*

$$td = ROT - TS$$

Where: *td = temperature difference between optimal and observed values, ROT = Rounded observed temperatures (to the whole number), TS = Temperature standard (long term average)*