



Model to assess water movement from a shallow water table to the root zone

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Accepted 12 February 2003

Abstract

UPFLOW is a simple software tool developed to estimate with limited data availability and appropriate assumptions the expected upward water movement from a shallow water table to the root zone during a specific period (typically 10-day) in a specific environment. The program contains various sets of soil water retention curves that are considered as representative for various soil classes and indicative values for root water extraction for a number of crops. The environmental conditions are specified in fields of a spreadsheet type Main Menu by specifying: (i) the average evapotranspiration (ET) demand of the atmosphere during the period under consideration, (ii) the expected soil wetness in the topsoil as a result of rain during that period, (iii) the depth of groundwater below the soil surface, (iv) the water extraction pattern of the plant roots, (v) the thickness and characteristics of successive layers of the soil profile and (vi) the salt content of the water table. A steady state upward flow is assumed during the period. The simulations are in line with indicative values presented in literature. Additionally, the software displays the deficient aeration conditions in the root zone and its effect on crop evapotranspiration when the groundwater is close to the soil surface.

The model was used to estimate the capillary rise from shallow groundwater (1–1.5 m) to the root zone (0.4–0.6 m) of horticultural crops in loamy sand and sandy loam soils in Belgium. The field measurements confirm that UPFLOW simulates the correct order of magnitude of the capillary rise to the root zone.

UPFLOW is public domain software and hence freely available. An installation disk and manual can be downloaded from the web.

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Keywords: Capillary rise; Groundwater; Soil water balance

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