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DIDAS- A new approach and user-friendly software package for assisting Drip Irrigation Design and Scheduling

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Abstract

The DIDAS software package was developed for the purpose of assisting irrigators in the design of drip irrigation systems and in irrigation scheduling. The program performs computations based on analytical solutions of the relevant linearized water flow and uptake problems. Water flow is described by superposition of solutions for positive sources (on-surface or subsurface emitters) and negative sources (plant root systems). Steady water flow is assumed in the design module and unsteady flow is used in the irrigation scheduling module. The design tool is based on a new, relative water uptake rate (RWUR, ratio between water uptake rate and irrigation rate) criterion suggested for deciding upon the distances between emitters along drip lines and between drip lines. The maximum possible RWUR is evaluated assuming no soil-plant-atmosphere resistance to water uptake. Namely, the plant roots apply maximum possible suction and the water uptake is determined just by the capability of the soil to conduct water from the sources (emitters) to the sinks (rooting zones). The computations of the RWUR requires only a minimum number of three parameters describing the soil texture, the size of the root zone and the potential evaporation, in the few cases when it is important to account for also evaporation form the soil surface. The irrigation scheduling optimizing tool is based on a relative water uptake volume (RWUV, ratio between daily water uptake volume and daily irrigation volume) criterion. The computations of the diurnal patterns of the water uptake rates and the daily RWUV for a given irrigation scenario require additional information on the diurnal pattern of the plant resistance to water uptake and on the hydraulic conductivity of the soil. DIDAS was programmed in DELPHI and it runs on any Windows operating system-PC, with no further software requirements. The construction of the drip irrigation scenario is performed via few GUI windows, which contain also a library of the required input parameters, and several best-fitting procedures. The computed RWURs and RWUVs are displayed graphically and the tabulated output results can be exported to e.g. Windows Excel for further processing. A beta version of the DIDAS freeware package can be downloaded from the web site of the Institute of Soil, Water and Environmental Sciences, ARO.

Biography

Shmulik Friedman has completed his Ph.D at the age of 35 years from Hebrew University of Jerusalem and postdoctoral studies from Cambridge University. He is a senior research scientist in the department of Environmental Physics and Irrigation of the Israeli ARO. He has published more than 60 papers in reputed journals.