



## **Towards an improved database of soil hydraulic properties for The Netherlands**

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Soil hydraulic functions underpin many results of research for advise on environmental policy in The Netherlands. Examples include numerical simulations of the leaching of pesticides, nitrate and phosphate, the drying of natural areas due to the lowering of groundwater levels to benefit the agricultural sector, and of the soil water storage capacity in agricultural land and natural areas. Since the 1980s, the Staring series (Wösten et al. 1987, 1994, 2001) is used as the source of information for soil hydraulic functions of soils in The Netherlands. This database classifies soil hydraulic functions in groups of similar soil texture and organic matter content for topsoils and subsoils. Recent research has shown that the classification in the Staring series does not sufficiently differentiate soils with regard to their hydrological behaviour (Wesseling, 2009), and that there is an urgent need for the improvement of the measurement, functional description, and documentation of soil hydraulic functions.

The objective of this study was to evaluate the measurements, functional description and documentation of the soil hydraulic functions included in the Staring Series, and to give recommendations for improvement. The results show the measuring techniques applied in The Netherlands generally yield data for pressure heads between approx. -100 and -600 cm. Both the wet range ( $h > -100$  cm) and the dry range ( $h < -600$  cm) are not measured but generally estimated with the Mualem-Van Genuchten approximation by fitting a curve through the measured values and extrapolating at the wet and dry ends, thus yielding a high uncertainty. The application of the Mualem-Van Genuchten equations appear to limit the quality of the fits It appears to be impossible to fit a multi-curved line with these kinds of equations. Mathematical alternatives like cubical splines were demonstrated to offer a promising alternative. The study shows that the systematic documentation of basic properties of the soil horizons to which the soil hydraulic functions refer offers the possibility to select soil hydraulic functions from broader groups in soil classifications, like the one employed in the Staring Series. The study demonstrates the set-up and implementation of a new database for soil hydraulic properties for The Netherlands.