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Compaction effect on soil hydraulic conductivity

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Soils as boundary layer are generally described as heterogeneous media from the point of view of the water flow. The hydraulic conductivity shows extreme high relative variability sampled from equivalent horizons or depth within landscape mapping units of the same soil series (Upchurch et al., 1988).

Altogether 52 core samples were collected from three different map units and two fallow and a maize fields in an alluvial area in Hungary. Hydraulic conductivity (Ks), particle size distribution, dry bulk density, specific density and organic matter content of the samples were determined. Statistical empirical and deterministic scaling models were used for predicting Ks of the samples (Campbell, 1975; Miyazaki, 1996). The geometric mean of the measured and estimated Ks values were compared and used to characterize the soil surface Ks of the three areas. A numerical simulation model was used to indicate the differences between the measured and the estimated Ks values on the crop yield and evapo-transpiration (ET) in normal, wet and dry climate years.

Simulated yield and ET of the maize crop differed significantly only in the dry climate year. From this it follows that the lack of compaction data makes conventional soil maps useless for estimating consequences of the soil water flow processes especially under dry climatic conditions.