Turkish Journal

of

Agriculture and Forestry

Keywords
Authors

agric@tubitak.gov.tr

Scientific Journals Home Page

Turkish Journal of Agriculture and Forestry

Comparing Neural Networks, Linear and Nonlinear Regression Techniques to Model Penetration Resistance

Hossein BAYAT[1], Mohammad Reza NEYSHABOURI[1], Mohammad Ali HAJABBASI[2], Ali Akbar MAHBOUBI[3], Mohammad Reza MOSADDEGHI[3]

[1]Department of Soil Science, Faculty of Agriculture, Tabriz University, Tabriz - IRAN

[2]Department of Soil Science, Faculty of Agriculture, Isfahan University of Technology, Isfahan - IRAN

[3]Department of Soil Science, Faculty of Agriculture, Bu-Ali Sina University, Hamadan 65174 - IRAN

Abstract: Penetration resistance (PR) is an important property of soils, and can be expressed as cone index (CI). Because of high variability, there are no accurate and representative PR data in most cases. Variable PR is considerably affected by gravimetric soil water content (GWC) and bulk density (BD). In this study, artificial neural networks (ANNs) were used to simulate relationship between BD, GWC, and CI. A data set of 381 samples was collected from 2 study sites, Hamadan and Maragheh. Pedotransfer functions (PTFs) were developed using ANNs and linear and nonlinear regression models to predict CI for the combined data set and each data set separately. For the combined and Hamadan data sets, ANNs produced a greater correlation coefficient (R = 0.85) and lower root mean square error (RMSE) compared with the linear regression model (R = 0.70). For the Maragheh data set, however, the regression model yielded better results. Introducing TP and relative saturation (Q_V/TP) into the models improved the prediction of CI. The results further showed that ANN models performed better than nonlinear regression models. Therefore, ANNs were recognized as powerful tools to predict CI by BD, GWC, TP, and Q_V/TP as the independent variables under the very diverse conditions of the soils and treatments employed.

Key Words: Artificial neural networks, bulk density, cone index, regression models, water content

---

Turk. J. Agric. For., **32**, (2008), 425-433.
Full text: pdf
Other articles published in the same issue: Turk. J. Agric. For.,vol.32,iss.5.