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PREDICTING HYDRAULIC CONDUCTIVITY OF NIGERIAN AGRICULTURAL SOILS USING DIMENSIONAL ANALYSIS

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ABSTRACT

A mathematical model for predicting the hydraulic conductivity of Nigerian agricultural soils in Imo and Abia states at 0 to 15cm depth was presented using dimensional analysis. The model was based on the Buckingham's π theorem using the following soil properties; Bulk density, Porosity, Cation Exchange Capacity, Soil pH, Exchangeable sodium percentage, Organic matter content, Particle density, % Clay, % Silt, % Sand, Acceleration due to gravity, fluid density and depth of soil. The model was validated with the data from the three locations (Soil subgroups) not used in building the model and there was no significant difference between the measured and the predicted hydraulic conductivity values at 5% level of significance. A high coefficient of determination of 0.940 between the measured and the predicted values was also observed.

KEYWORDS: Agricultural Soil, Dimensional Analysis, Hydraulic Conductivity, Prediction Equation