

Characterization of Erodibility Using Soil Strength and Stress-Strain Indices for Soils in Some Selected Sites in Enugu State

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Abstract : In this study, initial soil strength indices (q_u) and stress-strain characteristics, namely failure strain (ϵ_f), area under the stress-strain curve up to failure (I_s) and stress-strain modulus between no load and failure (E_s) were investigated as potential indicators for characterizing the erosion resistance of two compacted soils, namely sandy clay loam (SCL) and clay loam (CL) in some selected sites in Enugu State, Nigeria. The unconfined compressive strength (used in obtaining strength indices) and stress-strain measurements were obtained as a function of moisture content in percentage ($mc\%$) and dry density (γ_d). Test were conducted over a range of 8% to 30% moisture content and 1.0 g/cm³ to 2.0 g/cm³ dry density at applied loads of 20, 40, 80, 160 and 320 kPa. Based on the results, it was found out that initial soil strength alone was not a good indicator of erosion resistance. For instance, in the comparison of exponents of $mc\%$ and γ_d for jet index or erosion resistance index (J_i) and the strength measurements, q_u and E_s agree in signs for $mc\%$, but are opposite in signs for γ_d . Therefore, there is an inconsistency in exponents making it difficult to develop a relationship between the strength parameters and J_i for this data set. In contrast, the exponents of $mc\%$ and γ_d for J_i and ϵ_f and I_s are opposite in signs, there is potential for an inverse relationship. The measured stress-strain characteristics, however, appeared to have potential in providing useful information on erosion resistance. The models developed for the prediction of the extent or the susceptibility of soils to erosion and subjected to sensitivity test on some selected sites achieved over 90% efficiency in their functions.

Keywords : characterization of erodibility, selected sites in Enugu state, soil strength, stress-strain indices

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