INTEGRATED GEOPHYSICAL INVESTIGATION FOR CHARACTERIZATION OF HYDROMORPHIC SOIL IN PART OF SOUTHWESTERN NIGERIA

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Hydromorphic soil otherwise known as valley bottom soils have potentials for high and sustainable agricultural production due to their inherent characteristics of shallow water, deposition, accumulation of organic matter and residual available moisture for farming. However, hydromorphic soils have been little studied and under-utilized in Nigeria. Integrated geophysical investigation was conducted on a hydromorphic soil in part of Southwestern Nigeria to determine subsurface geometry, lithologies and water table in relation to its agricultural significance.

Non-invasive geophysical methods which include GSSI GPR equipment with 400MH antennas system and one dimensional electric resistivity survey involving VES were employed. Eleven GPR data were collected in the W – E direction, six in N – S direction at different lengths with 20 m inter profile spacing. Twenty-eight VES were conducted within the study area with current electrode ranging from 2.0 m to maximum of 150 m using Schlumberger array GPR data was processed using Radan 7 software while VES data was subjected to iteration using WINDRESIS software.

The GPR radar sections show three different horizons which include: sub-parallel reflections horizon assumed to be reworked topsoil with thickness ranging from 0.2-0.3 m, low amplitude continuous and weak reflections horizon indicating attenuated signal because of high moisture content with a thickness range of 0.9 - 1.4 m and multiple chaotic, non-parallel reflectors horizon. VES results show system of two to four geo-electric layers comprising; topsoil, saturated clay, and fractured/fresh basement.

Delineated layers for both geophysical methods show some degree of correlation. The relatively shallow depth and high water retentive capacity of the second layer accounts for its usage for farming at the peak of dry season.