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Geophysical exploration techniques for soil precision mapping in Agriculture in Delta State Nigeria: A pilot study

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Geophysical methods and soil test analysis have been used to study soil properties in the farm of the Centre for Entrepreneurial Studies (CES), Delta State University Abraka Nigeria. Vertical electrical sounding (VES), borehole geophysics, electrical resistivity tomography (ERT) and geochemical methods were used for the study. Seven VES stations were occupied along five traverses ERT measurements. Soil samples were collected close to the VES stations for soil test and grain size analysis to corroborate the VES and ERT results. The results of the topsoil obtained from the VES is in agreement with the ERT and borehole log results and this ranges from fine grained silt topsoil to sandy clay. The low resistivity of the topsoil is as a result of partial decomposition of plants and animals forming organic matter, and ranges from 168–790 Ω m with average value of 494 Ω m and average depth of 2.3 m. This depth cover the upper root zone of some significant crop, and depict a high amount of moisture and mineral nutrients, and a fair degree of stoniness to aid adequate rooting of the crops. Also, the observed topsoil is high in porosity and water retention which are major suitable factors for the yield of tuber and stem plants. The soil test results gave pH: 6.13-7.16, organic matter: 6.48-8.66 %, Nitrogen: 65.72-78.21 %, Phosphorus: 53.32-67.43 %, Copper: 14.16-22.61 mg/kg, Nickel: 1.16-3.11 mg/kg, Lead: 4.00-8.84 mg/kg, Arsenic: 0.08-0.1 mg/kg Iron: 96.33-151.63 mg/kg. These recorded concentrations are below the WHO standard for crop production.

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Keyword-2

Precision Agriculture

Keyword-3

Crop yield

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