

SUSTAINABLE REMEDIATION STRATEGIES FOR OIL-CONTAMINATED AGRICULTURAL SOILS OF SOME SELECTED LOCAL GOVERNMENT AREAS IN DELTA AND RIVERS STATES NIGERIA

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Abstract

Oil spills in Nigeria's South-South region have severely degraded agricultural soils, threatening food security and ecosystem health. This study assessed the impact of petroleum contamination on soil properties, crop growth, and hydrocarbon levels in Delta and Rivers states. Sampling was carried out in the two states. One local government area was purposively selected from each state: Eleme (Rivers) and Warri South West (Delta). Twelve (12) soil samples were conveniently collected in each LGA's — ten (10) polluted and two (2) unpolluted (control). Samples were collected at a depth of 0–30 cm. Soil analysis revealed significant variations: Delta-soils were mostly sandy (92.9–96.9% sand) with elevated salinity (EC: 9.7–29.5 $\mu\text{S}/\text{cm}$), while River soils were silt-dominated (86.5–96.3% silt) and richer in potassium (K: 4.0–7.2 mg/kg). Heavy metal contamination was severe at control sites, with DTCL1 and DTCL2 showing excessive Zn (50–59.6 mg/kg), Cu (20.6–30.8 mg/kg), and Cd (11.4–11.9 mg/kg). Hydrocarbon profiling identified gasoline-range (C_7 – C_9) compounds as dominant, while diesel-range (C_{11} – C_{14}) contaminants indicated older spills in RV. Maize growth trials demonstrated better performance in RV soils, correlating with higher Mg (17.7–36.7 mg/kg) and K (4.47–6.47 mg/kg) uptake. However, phytotoxicity and nutrient imbalances were observed in high-metal zones. The findings underscore the need for targeted remediation, including phytoremediation and organic amendments, to restore soil fertility. Policy interventions for spill monitoring and sustainable land management are recommended to safeguard agricultural productivity in the Niger Delta.

Keywords: Oil spills, soil contamination, heavy metals, hydrocarbons,