

SOIL ENRICHMENT AND PLANT NUTRITION SYNERGY IN OUR QUEST FOR FOOD SECURITY

ABSTRACT

Sustainable soil enrichment is vital to achieving sufficient food production for human survival while augmentation of natural fertility with fertilizer nutrients is a *sine qua non* for sustainable soil and crop productivity. As in most tropical regions of the globe, farmers in Nigeria must contend with cultivation on increasingly poor fertility soils. However, plant nutrition is the basis for fertilizer application and soil testing, a *desideratum* for fertilizer recommendation. This lecture focuses on a 'tripod' of soil-enrichment, plant-nutrition and food-security. These fundamental issues are highlighted under soil fertility management, science and practice of plant nutrition, significance of integrated plant nutrition management, fertilizer use and policies for solving agricultural input challenges, soil resource management for yield maximization and soil sustainability, presidential fertilizer initiative (PFI) as well as anchor borrowers programme. Brief reports on some of our previous research efforts are also spotlighted.

My contributions focused on comparative study of conventional methods of soil analysis and the electro-ultrafiltration (EUF) technique for soil fertility assessment, soil enrichment with sole or combined organic and mineral fertilizers for the production of seedlings of permanent crops like tea and cacao, use of *Moringa oleifera* (lam.) plant parts, use of indigenous phosphate rocks (PRs) for crop production, pineapple propagation and response to nutrient sources as well as the use of biochar for sustainable soil improvement and crop production.

Results revealed that the EUF technique surmounted the limitations of the conventional soil testing procedures, being a more precise extraction technique that is basically used for plant nutrition studies. Organic residues and urea proved to be effective nitrogen sources for tea plants, increasing leaf biomass production over the control. Optimum residue application of 75 or 150 kg N/ha compared favourably with 300kg N/ha of urea to convincingly prove that readily available organic fertilizers like sawdust and tea fluff can be used as alternatives to the expensive urea for tea production. Moringa leaves contained more plant growth-promoting nutrients than gliricidia leaves and commercial organic fertilizer and could be substituted for mineral fertilizer in arable crop production. The Nigerian Phosphate Rocks contained high total-P contents with soil ameliorating potentials especially when combined with

organic amendment. They possess great potentials as response by cereals manifested as early as three weeks when applied one week before or after planting. Furthermore, they enhanced plant growth in areas with rainfall above 1,200 mm, but not in semi-arid zones unless with irrigation. Ogun Rock Phosphate and crystalliser (a blend of Sokoto RP and Talc magnesite ore) performed much better than single super phosphate. Biochar also served as a good soilless growth medium, exhibiting high potentials for enrichment and sustenance of soil and crop productivity in the country. Plant's anchorage in soil influences numerous shoot-root system processes while water and nutrient movement from soil to plants depends on many forces that could result into the creation of a desirable nexus for an amazing plant nutrition and soil fertility synergy with high propensity for ensuring food security.

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