

Effects of Lime, inorganic P and inoculation on Soil Chemical properties and Grain Yields of Maize and Soybean in Western Kenya

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Abstract:

Low crop responses to fertilizer application among small holder farms are common phenomena in degraded acidic soils of western Kenya. Continuous growing of maize without commensurate soil nutrient replenishment coupled with application of soil acidifying fertilizers, especially Di-ammonium Phosphate (DAP) and Sulphate of ammonia (SA) have aggravated the soil acidity problem. An on-farm trial was sited in Shianda sub-location, East Wanga division in Mumias district, Western province, Kenya during the 2011 long rain (LR) and short rain (SR) seasons to determine the effect of lime, inorganic P, inoculation on soil chemical properties and yields of soybean (*Glycine max L.*) and maize (*Zea mays L.*). The treatments included, 2 lime rates (0, 2.5 t/ha), 2 inorganic Prates (0, 30 kg P/ha) with or without inoculation (*Rhizobium japonicum*) of soybean. The eight treatments were arranged as factorial in RCBD with four replicates. All data were analyzed with the ANOV A procedure of the GENST AT statistical software and treatment means separated using least significance difference at ($P < 0.05$). Regression analysis was performed to examine relationships between plant and soil parameters. Benefit-cost analysis was performed on maize and soybean grain yields to determine the treatments with the most profitable returns. A combination of Lime + P + inoculation recorded the highest maize (4490 kg/ha, 3470 kg/ha) and soybean (970kg/ha, 830kg/ha) grain yields during the first and second seasons, respectively. Sole P treatment gave a higher average nodule number per plant and plant biomass (g), respectively (8 and 21.8) than sole inoculation (4 and 19.2) and sole lime treatments (2 and 16.8) during the first season. Lime application at 2.5 t/ha increased soil pH from 4.9 to 5.58. Increase in soil available P was in the order' of lime> P > inoculation (9.35 > 6.50 > 5.10) mg/kg. Sole lime treatment proved 'to be a more profitable investment for the farmers as it gave. a net benefit of Ksh 89,015.20 with a benefit-cost ratio (BCR) of 2.2. Therefore, integration of lime, inorganic P and inoculation needs to be disseminated among small-scale farmers in western Kenya for improved maize and legume production.