

# Lime and Manure Application to Acid Soils and their Effects on Bio-Chemical Soil Properties and Maize Performance at Kavutiri - Embu County

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## **Abstract:**

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Soil acidity is widespread globally, accounting for about 40% of total arable soils. In Kenya, acid soils cover about 13% of total land area and are distributed widely in the croplands of central and western Kenya regions, covering over one million hectares. The main limitation of crop productivity in Kavutiri, Embu, is soil acidity and more specifically aluminium toxicity. The objective of this study was to determine the effects of agricultural lime in combination with farmyard manure (FYM) on soil properties (exchangeable acidity, pH, and microbial biomass) and maize growth. The treatments include: goat manure at 3 levels (0, 5 and 10 Mg ha<sup>-1</sup>) and agricultural lime (CaCO<sub>3</sub>) at 6 rates (0, 2.5, 5, 7.5, 10, and 12.5 Mg ha<sup>-1</sup>). The study was carried out in two phases. Phase 1 was carried out at the greenhouse with pots arranged in a complete randomised design (CRD) and replicated thrice while phase 2 was carried out on a farmer's field at Kavutiri where the soil samples for phase 1 were taken. Only the best three performing treatments in phase 1 were selected and verified during phase 2 in a complete randomised block design (CRBD) with three replicates. In each phase, maize was the test crop and was grown for a period of 8 weeks. The biophysical data generated from the study was analysed using Analysis of Variance (ANOVA) in Genstat statistical package. Treatment means were compared at probability  $p < 0.05$  using Fischer's least significant difference (L.S.D). Results of this study indicate that soil acidity decreased with increase in manure and lime levels. The treatment M10L12.5 –with 10 Mg ha<sup>-1</sup> of manure and 12.5 Mg ha<sup>-1</sup> of lime - recorded the highest pH of 6.3 and 5.9 for greenhouse and field trials, respectively. Maize growth parameters (root length, height and biomass dry weight) were found to increase significantly as levels of manure and lime increased. Treatment M10L12.5 from greenhouse trial recorded the highest values for root length (41.3 cm), height (150.3cm) and dry biomass weight of 755.4 Kg ha<sup>-1</sup>. Microbial biomass was found to be higher in the field than in greenhouse trials with the highest value of  $28.8 \times 10^5$  and  $26.7 \times 10^3$  Colony forming units (CFU) for bacteria and fungi, respectively. This marked significant increases ( $P < 0.05$ ) of 772.7 and 86.6% for bacteria and fungi, respectively above the control. From the study, it was concluded that combining 10 Mg ha<sup>-1</sup> of FYM and 12.5 Mg ha<sup>-1</sup> of agricultural lime could be a promising alternative amendment for acid soil management strategy for increased maize production at Kavutiri and other related soils in Kenya.