



## Sustainable Intensification of Maize-based Cropping Systems in Semi-arid Tanzania through Improved Nutrient Management

Ahazi Mkoma<sup>1</sup>, Anthony Kimaro<sup>2\*</sup>, Jonhson Semoka<sup>1</sup>, and Martha Swamila<sup>2\*</sup>

<sup>1</sup>Department of Soil Science, Sokoine University of Agriculture

<sup>2</sup>International Centre for Research in Agroforestry (ICRAF); ICRAF-Tanzania Country Programme,

\*Corresponding author: Anthony Kimaro, [a.kimaro@cgiar.org](mailto:a.kimaro@cgiar.org)

### Abstract

Estimating crop response to fertilization and identification of affective fertilizer materials is important to meet nutrient requirements of maize and sustain soil fertility. Unlike other agro-ecological zones, no fertilizer recommendations have been developed for semi-arid zone in Tanzania. To fill this gap field experiments were carried out to develop phosphorous (P) fertilizer rates and identify the effective P source for this zone. Randomized complete block design (RCBD) with three replications was adopted in this study that was conducted in Moletli and Njoro villages during the 2013 and 2014 growing seasons. Triple Super Phosphate (TSP) fertilizer was used to test the various application rates: 0, 7.5, 15, 30 and 45 and 60 kg P ha<sup>-1</sup>. For P-source trials, Minjingu Mazao, Minjingu hyperphosphate and TSP were compared at 30 kg P ha<sup>-1</sup> for each fertilizer material. Maize, monoculture or intercropped with pigeonpea was used as the test crop in the two fertilizer trials. Soils in the study sites were deficient of P (5.53 mg/kg), N (0.045%) and Ca (3.03 Cmol<sup>(+)</sup>/kg) and had very low organic matter content. Maize yield in across the two sites increased with fertilizer application rates and peaked at 30 kg P/ha in both maize monoculture (4.2 t/ha) and pigeonpea intercropping (3.9 t/ha). Maize yield after this rate declined slightly, possibly reflecting nutrient toxicity, representing 110 and 140 % yield increases relative to the control. Average maize yield at 15 kg P/ha in monoculture (3.6 t/ha) and intercropping systems (3.3 t/ha) was not significantly different from yield obtained with the application of 30 kg P/ha, suggesting that farmers may reduce the application rate by 50% without losing yield significantly. Maize grain yield after Minjingu Mazao was similar to the yield obtained with TSP application in Moletli village (3.6 vs 3.7 t ha<sup>-1</sup>) and Njoro village (3.9 vs 4.2 t ha<sup>-1</sup>). High response of maize to Minjingu mazao is attributed to slightly acidic soil condition, fortified N, Calcium and micronutrients in this fertilizer material. Economic assessment is going on to come up with the cost effective fertilizer recommendations for this semi-arid zone, but agronomic results suggests that farmers may use Minjingu Mazao as an alternative to TSP at 15 kg P/ha.

[www.africa-rising.net](http://www.africa-rising.net)

