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## Maize response to fertiliser microdosing in agroforestry parklands in the Savannah region of Ghana

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### Abstract

Maize (*Zea mays* L.) is the most important cereal crop in Sub Saharan Africa. Hence, soil fertility management through the application of inorganic fertiliser is critical for sustainable maize production. During the last two decades fertiliser microdosing has been promoted throughout the region as there is ample evidence that it increases maize yield. However, most of these results were obtained from maize monocultures. This study therefore aimed to assess the effect of microdosing on maize yield in *Vitellaria paradoxa* C.F. Gaertn. parklands in the Savannah Region of Ghana. To this end four isolated *V. paradoxa* trees were selected in farmer fields whereby each area of tree influence was delineated into canopy area (Zone A), 3 m away from canopy (Zone B), 10 m away from canopy (Zone C), and 20 m away from canopy (Zone D). In each zone, three fertiliser application treatments were implemented on maize. These were (i) farmers' practice without fertiliser application (FP), (ii) microdosing (MD) which involves placing 1.5 g of NPK 15-15-15 into the planting hole together with the seeds (14 kg N ha<sup>-1</sup>, 6 kg P ha<sup>-1</sup>, 12 kg K ha<sup>-1</sup>), and (iii) national recommended (NPK) application NPK rate (30 kg N ha<sup>-1</sup>, 13 kg P ha<sup>-1</sup>, 25 kg K ha<sup>-1</sup>) applied at the time of planting and urea (30 kg N ha<sup>-1</sup>) applied 6 weeks after planting. For grain yield there was a significant interaction between Zone and fertiliser application whereby grain yield of NPK at Zone D was 2.5-times higher ( $p = 0.03$ ) than grain yield of FP in Zone A. Average stover yield of NPK and MD was 31 % lower ( $p < 0.01$ ) than stover yield of FP. Fertiliser use efficiency in MD plots were 44 % higher ( $p < 0.05$ ) than in NPK plots. Although soil electrical conductivity (EC) and organic carbon (SOC) in Zone A were 28 % and 16 % higher than the averages of Zones B, C, and D, these differences were not statistically significant. We conclude that in agroforestry parklands, maize fertilised with MD can produce yields comparable to the much higher recommended application rate of broadcast fertiliser.

**Keywords:** Agronomic efficiency, fertiliser application, soil fertility, sustainable agriculture, tree crop interactions