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NPK fertiliser type and time of application effect on growth, yield and profitability of maize production

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Abstract

Fertiliser management is key in soil fertility amelioration for improving maize production. This study examines the effect of basal fertiliser type and time of its application on growth, yield and profitability in smallholder maize production. The study was conducted on-farm in Northern Region of Ghana for 2 years (2019–2020). A 2×3 factorial treatment combination laid in randomised complete block design with 4 communities as replicates was used. The treatments were basal fertiliser types (blend and compound fertiliser) and time of fertiliser application (full rate at planting, full rate at 2 weeks after planting (2WAP) and half rate at planting and 2WAP). We measured agronomic data on leaf area index (LAI), plant height and biomass at 14, 24, 34, 44 days after planting, grain yield, ammonia gas emission, nitrogen (N) uptake in grain and apparent N recovery efficiency (ANRE). Economic profitability data on benefit cost ratio (BCR) and return on investment (ROI) were also calculated for the treatments. The NPK fertiliser type did not show significant effect on all the parameters measured. Applying basal NPK fertiliser at planting of maize significantly increased LAI (55–100 %), plant height (11–42 %), plant biomass (19–71 %), N uptake (7 %), ANRE (81 %), grain yield (47 %), BCR (30 %) and ROI (12-fold) relative to the conventional practice of 2WAP. Applying basal NPK fertiliser at planting also reduced the ammonia gas emissions by 20–47 % compared with the conventional practice of 2WAP. Split application of basal fertiliser at planting and 2WAP increased cost of production by 6 % compared with applying full rate of basal NPK at planting. However, the increase in the cost of production from the split application could not generate enough revenue to offset additional cost of production. The results suggest that applying basal NPK fertiliser to maize at planting will enhance sustainability of smallholder maize production in northern Ghana and similar agro-ecologies through its effect on productivity, environmental pollution, food security, profitability and livelihoods.

Keywords: Fertiliser timing, nutrient use efficiency, savannah , yield, zea mays