

Article title	Optimizing fertilizer use efficiency for sustainable maize production in strongly acid soils of the Sudan Savanna agroecological zone of Northern Ghana
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Abstract	<p>Given the importance of maize as a staple crop in northern Ghana, and the prevalence of acid soils used for maize production in the region, identifying effective nutrient management is critical to realize the full benefits of fertilizer application in maize production. In a two-year field study, we evaluated different fertilization strategies in three communities to identify the one that will best optimize fertilizer use efficiency in maize production in poorly fertile acid soils. The fertilization strategies were: (i) farmer practice (FP), in which only NPK fertilizer was applied; (ii) NPK plus lime (NPK + L); (iii) balanced fertilization (BF), in which NPK fertilizer and limiting secondary and micronutrients were applied; (iv) balanced fertilization plus lime (BF + L); and (v) control, in which no fertilizer was applied. We determined maize grain yield, nutrient recovery, and agronomic efficiency and the potential profitability with the fertilization strategies. The greatest yield was obtained with the BF + L treatment, followed by NPK + L, BF, FP, and control, in that order. Compared to FP, the NPK + L treatment nearly doubled N recovery, tripled P recovery, and doubled K recovery from the applied fertilizer. Whereas a negligible increase in fertilizer recovery efficiency occurred with the BF treatment compared to FP; the N, P, and K recovery efficiency increased by nearly 3, 4, and 2.5 times, respectively, with the BF + L treatment compared with FP. Gross profit margin analysis showed that the greatest potential profit margin was obtained with the BF + L treatment, followed by NPK + L, BF, and FP, in that order. From the combined data, we conclude that addition of lime is key to increasing fertilizer efficiency in strongly acid soils, and with a holistic approach of simultaneous addition of lime and secondary and micronutrients to NPK fertilizers, farmers will optimize fertilizer efficiency and increase profitability of their farming operation substantially.</p>
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