

Article title	Managing essential plant nutrients to improve maize productivity in the savanna agroecological zones of Northern Ghana: the role of secondary and micronutrients
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Abstract	<p>Studies have shown that despite the positive response of maize to nitrogen (N), phosphorus (P), and potassium (K), actual yields in the savanna agroecological zones (AEZs) of northern Ghana remain well below the potential even with N-P-K fertilizer application. In a two-year nutrient omission trial in 12 locations within the Sudan savanna and Guinea savanna AEZs of northern Ghana, we quantified maize yield increases resulting from addition of secondary and micronutrients from the NPK-only fertilization practice for maize production in the two AEZs. In both years, applying only NPK fertilizer resulted in average yields of 3.6 t ha⁻¹ and 2.5 t ha⁻¹ in the Guinea savanna and Sudan savanna AEZs, respectively. However, addition of sulfur (S), zinc (Zn), and boron (B) to the NPK fertilizers (“balanced” fertilization) resulted in an average of 60% and 64% yield increases over those of the NPK-only treatment in the Sudan savanna and Guinea savanna AEZs, respectively. Compared to balanced fertilization, omission of S, Zn, and B reduced grain yield by an average of ~34%, ~28%, and ~14%, respectively. The combined data suggest that, even though secondary- and micronutrients are needed in small quantities by plants relative to N, P, and K, they have an enormous effect on crop productivity. Therefore, to ensure sustainably increased maize productivity in the savanna agroecological zones of northern Ghana, fertilizer recommendations should not be restricted to only NPK fertilizers but all limiting secondary- and micronutrients must be accounted for in a holistic and balanced fertilizer recommendation.</p>
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