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Introduction

- Smallholder farmers widely use nitrogen (N), phosphorus (P) and potassium (K) fertilizers for maize production in northern Ghana
- NPK fertilizer-induced yield increases appears to have plateaued, making it necessary to reevaluate other soil nutrients for their potential to boost crop yield. The objective of this study is to evaluate the effect of Zn and B on maize grain yield in a typical open parkland systems dominated by shea trees (*Vitellaria paradoxa* C. F. Gaertn)

Methods

- In a farmer – researcher trial shea trees were divided into zones; 0 m (under canopy), 3 m, 10 m and 20 m away from the canopy (Fig. 1, Fig. 2, Table 1)
- Each zone was sub-divided to implement different fertilizer applications: (i) farmer's practice without fertilizer application (FP) (ii) sole NPK fertilizer (national recommended rate (NR): 60 kg N ha⁻¹, 13 kg P ha⁻¹, 25 kg K ha⁻¹) (iii) NR plus 7.5 kg Zn ha⁻¹ (NRZn), and (iv) NR plus 1.5 kg B ha⁻¹ (NRB)

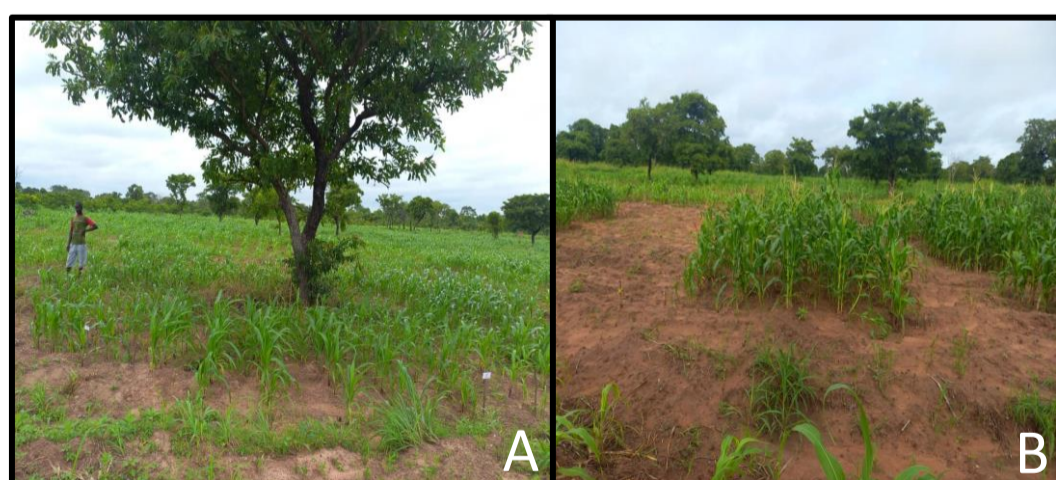


Figure 1. Maize plants under tree canopy (A), maize plants outside tree shade in Ghana (B)

Results & Discussion

- Maize grain yield increased ($p < 0.05$) from zone 0 m to 20 m (Fig. 3)
- Zone and fertilizer application interaction increased ($p < 0.05$) grain yield of NPK plus Zn in zone 20 m. It was 2.8 times larger than FP in zone 0 m (Fig. 3)
- Average monthly light intensity in zone 0 m was about 600 % less than those in 3 m, 10 m and 20 m (Fig. 2)

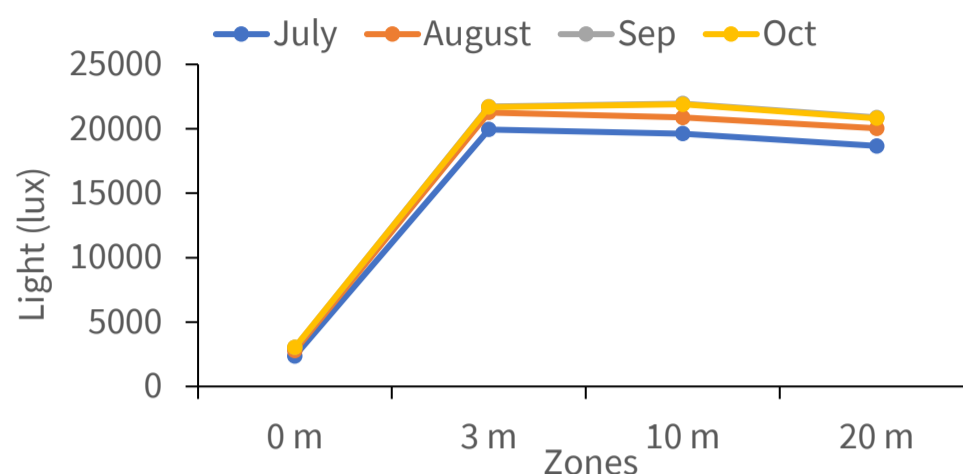


Figure 2. Light intensity in different zones of shea trees

Table 1. Soil parameters as affected by tree zone in Ghana

Zone	pH	OC g kg ⁻¹	EC mS m ⁻¹	K _{exch.} cmol kg ⁻¹
0	6.4	15.8	1.7	0.3
3	6.4	15.6	1.4	0.2
10	6.5	14.3	1.5	0.2
20	6.5	14.4	1.5	0.2
SEM	0.1	0.8	0.2	0.1
P-value	0.62	0.46	0.51	0.002

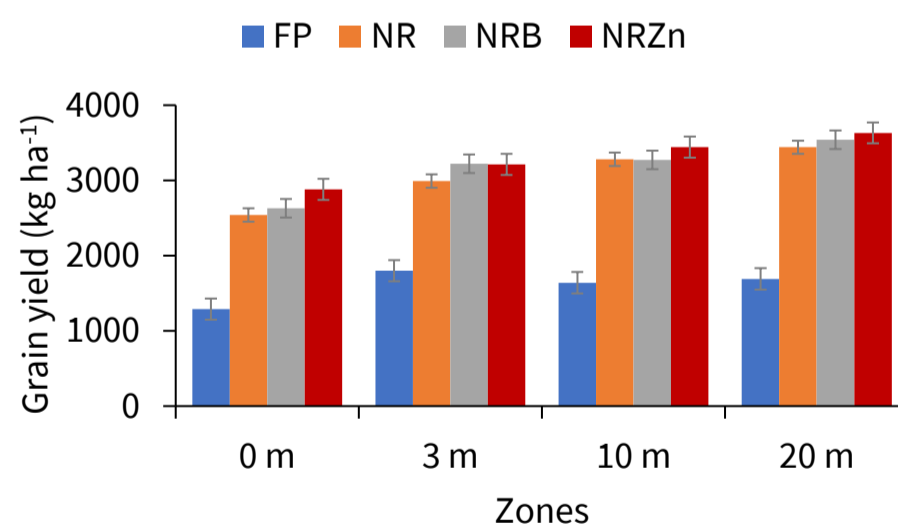


Figure 3. Maize grain yield as affected by zone and mineral fertilizer treatment

Conclusions

- Interaction effect of zone and mineral fertilizer treatment produced higher yields outside trees canopies
- Zn and B are not limiting farmers' maize yields in northern Ghana.
- Smallholder farmers could use sole NPK for sustainable maize production in open agroforestry parklands

