Agronomic and economic performance of fertilizer microdosing in the shea-maize agroforestry parklands of Ghana and Benin

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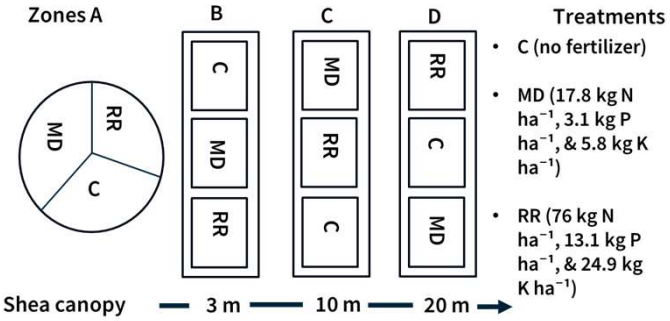
Introduction

Maize (*Zea mays* L.) is essential for food security in Africa, but yields remain low due to poor soil fertility and high fertilizer costs. Fertilizer microdosing (MD) offers a more efficient, cost-effective alternative, potentially improving productivity. This study evaluates MD yield, labor, and profitability impacts compared to conventional fertilization in *Vitellaria paradoxa* parklands systems.

Materials and Methods

Wewe, Benin & Busunu, Ghana



Results & Discussion

Table 1. Comparison of maize yields (t ha^{-1}) in *V. paradoxa* parklands systems.

	Benin		Ghana	
	Grain	Stover	Grain	Stover
Zones				
A	**1.6 a**	**2.7**	**1.9 a**	**2.7 a**
B	**2.2 b**	**3.3**	**2.2 b**	**3.1 b**
C	**2.3 b**	**3.3**	**2.3 b**	**3.2 b**
D	**2.2 b**	**2.9**	**2.4 b**	**3.3 b**
SEM	**0.1**	**0.1**	**0.1**	**0.1**
Treatments				
C	**1.8 a**	**2.5 a**	**1.6 a**	**2.7 a**
MD	**2.2 b**	**3.1 b**	**2.3 b**	**3.2 b**
RR	**2.7 c**	**4.4 c**	**3.0 c**	**3.5 c**
SEM	**0.1**	**0.1**	**0.1**	**0.1**

Means along the same columns with different alphabets are significantly different at ($p < 0.05$). SEM demotes the overall standard error of the mean.

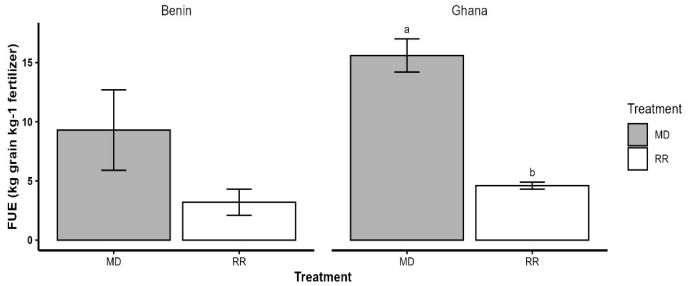


Figure 2. Comparison of fertilizer use efficiency (FUE) of fertilizer application strategies. Means with different alphabets are significantly different at ($p < 0.05$). SEM demotes the overall standard error of the mean.

- Effect of fertilization is similar regardless of the planting distance from the *V. paradoxa* canopy in both countries.
- RR produces significantly 27% and 67% greater grain yield compare to MD and no fertilizer respectively.
- MD demonstrated respectively 2.8 times and 3.4 times significantly higher FUE than RR in Benin and Ghana.
- Although the total cost of RR is 32% and 63% higher than MD and Control, RR achieved 42% 113% significantly higher profit than MD and Control.

Table 3. Comparison of total cost ($ ha^{-1}), revenue ($ ha^{-1}) and profitability ($ ha^{-1}) of fertilizer application strategies.

	Benin			Ghana		
Treatments	**Total cost**	**Revenue**	**Profit**	**Total cost**	**Revenue**	**Profit**
Control	**299 a**	**659 a**	**360 a**	**279 a**	**605 a**	**326 a**
MD	**343 b**	**804 b**	**461 a**	**373 b**	**941 b**	**569 a**
RR	**463 c**	**1223 c**	**760 b**	**480 c**	**1183 c**	**703 b**
SEM	**1.74**	**59**	**59**	**8**	**54**	**46**

Means along the same columns with different alphabets are significantly different at ($p < 0.05$). SEM demotes the overall standard error of the mean.

Conclusions

Fertilizer microdosing in shea parklands is less labor-demanding and increases maize yield and fertilizer use efficiency, making it a more efficient but less profitable option for resource-constrained smallholders' farmers.

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