Sustainable use of nitrogen fertilizer for intensive maize production in northern Ghana

Introduction

Maize is an important cereal crop in Ghana, especially in the northern part where it is replacing sorghum and millet. High yielding, drought and *Striga* tolerant varieties have recently been released. Their fertilizer nitrogen requirement to maximize grain yield on farmers' fields is not known.

Methods

Responses of extra-early (80-85 days), early (85-100 days) and medium (100-110 days) maturing maize varieties to five N fertilizer rates (0, 40, 80, 120 and 160kg/ha N) were evaluated in a multi-locational trial established at Manga (Upper East region), Wa and Tumu (Upper West region), and Damongo and Nyankpala (Northern region). For each maturity group, a split-plot design with four replications was used. The fertilizer N was applied as urea in two equal doses. All plots received, 60kg/ha P_2O_5 as Triple Superphosphate (TSP) and 60kg/ha K_2O as Muriate of Potash (MOP) at planting.

Results summary

The maize variety by N rate interaction was not significant for all the parameters recorded for all the maturity types. Maize variety significantly influenced grain yield at Manga, and nitrogen use efficiency (NUE) at Wa and Manga (Table 1). For each maturity group and at each location, maize had highest NUE at 40kg ha N and the least value at 160kg/ha.

Grain yield showed a non-linear response to increasing N rates (Figures 1, 2. 3). Overall, increase in N rates beyond 80 kg/ha did not result in significant increases in grain yield in most sites.

Conclusions

Nitrogen fertilizer rates between 80 to 120 kg/ha may therefore be ideal to optimize maize grain yields.

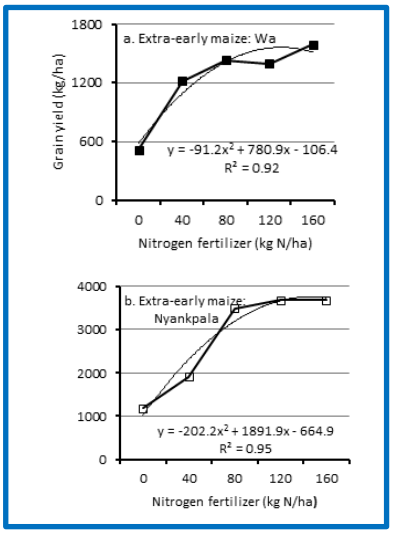

Figure 1 a, b: Extra-early maize

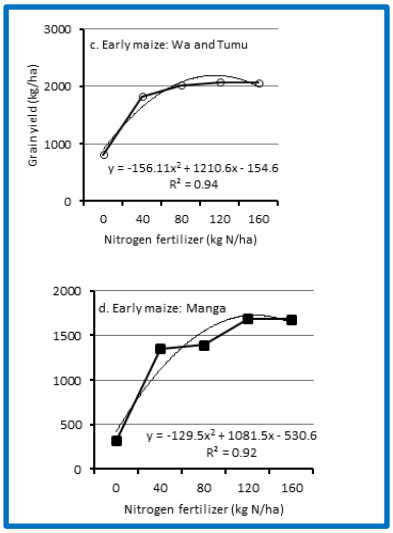

Figure 2 c, d: Early maize

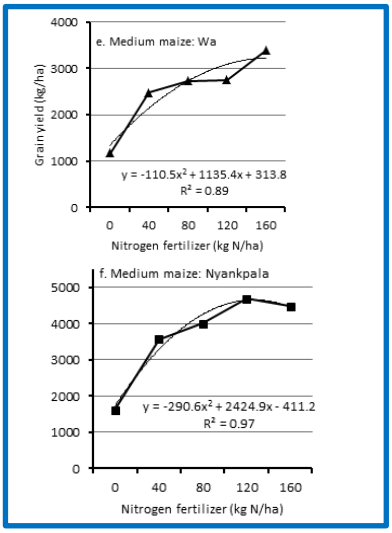

Figure 3 e, f: Medium maize

Table 1: Grain yield and nitrogen use efficiency of extra-early maturing maize

Region	Site	Variety	Grain yield (kg/ha)	NUE (kg/kg N)
Upper West	Wa	99 TZEE Y STR	1147	8.4
		TZEE W POP STR QPM C0	1492	13.7
		2000 Syn EE W CO STR	1199	10.4
		2004 TZEE W POP STR C4	1045	9.8
		Abontem	1278	11.5
		$LSD_{(0.05)}$	NS	NS
Upper East	Manga	99 TZEE Y STR	1180	11.9
		TZEE W POP STR QPM C0	1996	29.2
		2000 Syn EE W CO STR	1756	26.2
		2004 TZEE W POP STR C4	2349	33.9
		Abontem	2133	32.5
		$LSD_{(0.05)}$	788	8.2

The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads an associated project on monitoring, evaluation and impact assessment.

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