

Short Communication

Response of NERICA rice to fertilizer application at Doko, central Nigeria.

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A field study was conducted at Emitsu-Ndadan, near Doko in Central Nigeria during the cropping seasons 2008 and 2009. The objective of the study was to investigate the effect of four Nitrogen (N) rates, viz 0, 20, 40 and 60 kg/ha, on the growth and yield of NERICA 1 (FARO 55). The experimental design was RCB, with three replications. Plot size was 4.0m x 3.0m (12m²). Rice was direct -seeded at 25.0cm inter and intra-row spacing. Half dose of N- rates and full dose of K and P were applied at planting and the remaining doze of N at 4 weeks after planting (WAP).. Data were collected on the growth and yield parameters of rice which were subjected to statistical analysis. All the parameters except days to 50% flowering were significantly affected by the N rates application. The highest grain yield (3.11 t/ha) was obtained with the application of 60 kg/ha N in Vunchi in 2009, while the least grain yield of 700 kg/ha resulted from the no application or the control at Emitsu Ndadan in 2008. There appears to be a direct relationship between the yield response of NERICA 1 and the quantity of N-fertilizer application in all the examined locations.

Keywords: Nerica, Rice, Fertilizer, Nitrogen, Faro.

INTRODUCTION

Nigeria is the largest rice producer in the West African sub-region. The potential land area for rice production in Nigeria is estimated to be between 4.6 - 4.9 million hectares that is shared among the upland, rainfed and irrigated lowlands, deep water and mangrove swamp ecologies.

Upland rice production accounted for about 30 % of total land area used for rice production, which amounted to about 140,000 hectares of rice cultivation in Nigeria (Jaquot and Courtois, 1987). Although the area under upland rice production is quite enormous (Arradeau 1983, Gupta, 1983), the yield is still low and averages 1.0 t/ha or less (FAO 1989 and Singh et al 1997). Factors that are responsible for low yields are; biotic, abiotic as well as socio- economic (Jacquot and Courtois 1987, and Oikeh et al 2005). Abiotic factors include drought, low

fertility, acidity as well as soil erosion. A new rice Variety, NERICA (New Rice for Africa) has been developed and released by the African Rice Centre. One of the characteristics of improved varieties, including NERICA is high fertilizer responsiveness. The objective of the present study was to investigate the response of NERICA I (Faro 55) to different N-rates, with a view to determining the appropriate rate for increased yield and productivity.

METHODOLOGY

The Study Area

The study area lies in the Southern Guinea Savannah with sub-humid tropical climate. Annual rainfall in the area ranges between 1,200-1500mm that falls within 181-200 days between the months of June - October. Topographically, the terrain is gently undulating while the soil is classified as oxic paleustalf.

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Table 1: Soil test values of the experimental site

S/No	Parameter	Value
1.	Sand (%)	70.7
	Silt (%)	2.0
	Clay (%)	27.3
2.	Nitrogen (%)	0.03
3.	Organic – C (%)	2.51
4.	Total – P (Bray P-1) (ppm)	0.83
5.	Exchangeable K (Cmol/Kg)	1.25
	Exchangeable Ca (Cmol/Kg)	2.14
	Exchangeable Mg (Cmol/Kg)	8.41
	Exchangeable Na (Cmol/Kg)	2.13

Table 2: Effect of N- Rates on the growth and yield of NERICA at Emitsu-Ndadan, Doko in central Nigeria (2008)

Treatments	Germination count (%)	Plant height (cm)	Tiller No/stand	Days to 50% flowering	Pan/m ²	Grain yield (t/ha)
1	85.1 c	71.3 c	16.1 b	7.0	91. b	0.70 b
2	95.2 a	84.5 b	24.2 a	74.5	121.0 a	0.95 b
3	95.0 a	91.4 a	26.0 a	74.1	133.0 a	1.24 a
4	93.5 b	91.6 a	28.1 a	74.0	128.0 a	1.16 a
SE (T) =	0.41	7.21	2.04	4.4	0.56	2.21
SE (R) =	1.22	3.10	3.52	2.51	0.91	1.74
LSD (5%) =	1.11	5.3	10.1	NS	12.3	0.51
CV(%) =	4.3	5.3	9.4	4.1	10.3	10.2

^{a,b,c} = Means with different superscript within a column are significantly different $P < 0.05$; Treatments : 1-Control, 2; 20 kg/ha NPK, 3; 40 kg/ha NPK, 4; 60 kg/ha NPK

Field Experiment

The experimental design used was an RCB, with three replication. Plot size was 4.0m x 3.0m and Faro 55 upland Rice (NERICA 1) was direct seeded at 25.0cm inter and intra-row spacing. Fertilizer rates were 0, 20, 40 and 60 kg/ha N. Half dose of the rates and full K and P were applied as basal and the remaining N-dose at 4 weeks after planting (WAP). Emitsu Ndadan, Lemuta, Rogota, Vunchi and Danko were the sites or locations where the trials were replicated.

Agronomic data collected were plant height (cm) and Tiller No/stand at harvest, panicle per square meter (Pan/M²) and the grain yield. These were subjected to statistical analysis using ANOVA.

RESULTS AND DISCUSSION

The elemental composition of the soil of the experimental site is shown on Table 1, while the effect of N-fertilizer rates on the yield and some yield components of NERICA 1 for the two years are summarized on Tables 2 and

3. The result across the locations are presented as Table 4. Except for the days to 50% flowering, N-fertilizer rates significantly affected all the parameters determined in this study. Percent germination count (85.1) was least and highest under the control and 20 kg/ha N respectively. Similarly, mean plant height (71.3 cm), tiller No/stand (16.1), Pan/m² (91.0) and grain yield (700 kg/ha) were lower under the control. While the grain yield of 1.24 t/ha and Pan/m² (133) were obtained with the application of 40 kg/ha N, the highest tiller No/ stand was realized under the 60 kg/ha N. Irrespective of the location/site or the year, the control treatment consistently gave significantly lower yields than other N - treatments. The highest yields oscillated between 40 and 60 kg N/ha. The least and the highest yields of 0.7 t/ha and 3.11 t/ha were obtained under the control and the application of 60 kg N in the years 2008 and 2009 respectively. With respect to the season, 2009 appears to be more favorable in terms of yields, probably because of the steady rainfall and hence favorable soil moisture status and availability for rice growth and yields. Although the yields obtained are generally low which could be attributed to the combined effect of sandy texture that retained little water in soil and

Table 3: Effect of N- Rates on the growth and yield of NERICA at Emitsu-Ndadan, Doko in central Nigeria (2009)

Treatments	Germination count (%)	Plant height (cm)	Tiller No/stand	Days to 50% flowering	Pan/m ²	Grain yield (t/ha)
1	86.0 c	70.0 c	18.3 bc	75.0	99.9 b	1.82 b
2	94.3 a	84.9 b	22.3 ab	75.5	129.0 a	2.02 b
3	93.5 a	92.1 a	28.0 ab	76.1	153.0 a	2.5 a
4	94.5 b	92.0 a	28.4 a	75.1	148.0 a	2.3 a
SE (T) =	1.40	8.20	2.14	5.12	0.50	2.31
SE (R) =	0.26	3.22	4.32	3.31	0.80	1.52
LSD (5%) =	2.01	4.21	11.0	NS	10.3	0.60
CV(%) =	3.4	3.9	9.9	4.0	13.2	11.1

^{a,b,c} = Means with different superscript within a column are significantly different $P < 0.05$; 1 Control, 2; 20 kg/ha NPK, 3; 40 kg/ha NPK, 4; 60 kg/ha NPK

Table 4: Effect of N- Rates on the yields of NERICA at various locations within Doko in Central Nigeria in 2008 and 2009.

TREATMENT	Emits Ndadan		Lemuta		Rogota		Danko		Vunchi	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Control	0.70ab	1.82b	1.0d	1.02	0.83d	0.88c	1.11	1.04d	0.71c	1.13c
20 kg/ha N	0.95ab	2.02a	1.3c	1.71	1.33c	1.58b	1.7c	2.0c	1.37b	2.3b
40 kg/ha N	1.16b	2.5a	2.1b	2.8	2.0b	3.0a	2.2b	2.9b	2.3a	3.01a
60kg/ha N	1.24a	2.3a	2.8a	3.0a	2.6a	3.0a	2.6a	3.1a	2.3a	3.11a
SE (T)	2.21	2.31	1.1	0.79	0.63	1.4	0.82	1.9	1.0	2.2
SE (R)	1.74	1.52	1.0	0.34	1.3	1.1	0.66	0.34	1.1	1.5
LSD(5%)	0.51	0.60	0.21	1.1	0.22	1.2	0.3	0.51	0.13	1.7

^{a,b,c} = Means with different superscript within a column are significantly different $P < 0.05$; 1; Control, 2; 20 kg/ha NPK, 3; 40 kg/ha NPK, 4; 60 kg/ha NPK

also leached away the applied nutrients especially Nitrogen (N), the outcome of the present study is very significant because it opens another window of opportunity to farmers in the study area who cultivates lowland rice and are now amazed that Upland rice could also be profitably grown using appropriate technologies notably suitable varieties and agronomic practices . The general increased yield response of the rice with fertilizer application is characteristic of all improved crop varieties including NERICA lines.

CONCLUSION

The highest grain yield of 3.11 t/ha was realized will 60 kg/ha N, while the least was observed under control or no application. Thus, 60 kg/ha N is recommended for the study area, based on the available data. The study could be repeated with more locations for further validation.

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