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Performance of Maize Intercropped with Leguminous Browse Plant at Different Rates of Lime

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ABSTRACT
The experiment was conducted on the acid sandy soil of Michael Okpara College of Agriculture Umuagwo between 2000 / 2002 to determine the influence of leguminous browse species, on maize yield as an index of nitrogen transfer from the Baphia tree to the maize crop, compared with the influence of cowpea on maize in a similar intercrop at the same levels of lime. The highest grain yield of maize (2.75t/ha) in 2000 was recorded in the cowpea/maize intercrop and the lowest 0.51t/ha in the control plot crop. In 2001, highest grain yield (3.36t/ha) was in Baphia/maize intercrop and the lowest 0.6° t/ha in control plots. Seed weight, cob diameter and shelling percentage showed a similar trend. There was no significant difference in yields of maize at 1t/ha and 2t/ha of lime application.

INTRODUCTION
When chemical fertilizer was first introduced in this part of the Country, over 80% of the rural farmers refused to apply it to their crops with the reason that it would lead to tuber rots. However through concerted efforts of extension programme of World Bank and its counter part – agencies, over 98% of rural farmers embraced the use of fertilizers. As a result of lack of proper awareness on appropriate fertilizer application a number of farmers have been involved in wrong fertilizer handling. Consequently, there has been serious soil acidity leading to the destruction of soil microbes and gross reduction in crop yields. Apart from the problem associated with fertilizer handling, farmers still rush for it. Unfortunately fertilizer is now a scarce commodity beyond the reach of rural farmers. Alternative organic manure would have been good but its bulkiness makes handling difficult. A suitable alternative therefore, is bio – farming. This is an aspect of agro – forestry that involves the deliberate integration of leguminous fallow species and arable crops (Evensen, 1990). In this system, the leguminous component crop will help to improve the availability of nitrogen and other basic elements, to the companion crops. *Baphia nitida* is one of such legumes, Ssekabembe, (1985).

This study is therefore designed to achieve the following objectives:
(i) To determine the influence of *Baphia nitida* on the grain yield of *Zea mays*.
(ii) To determine whether liming the soil will assist the legume to improve the soil fertility.
(iii) To determine the optimum rate of lime for maximum seed yield of *Zea mays*.

MATERIALS AND METHOD
Location of the Experiment: The experiment was carried out at Michael Okpara College of Agriculture, Umuagwo Imo State in the rainforest zone of Nigeria. Rainfall distribution in the area is bimodal with peaks in June and September and a period of low precipitation in august.

The experimental site has a typical ultisol and some important characteristics of the top 15cm of soil sampled after ploughing to show the fertility status of the soil are shown below.

SITE UMUAGWO	SAMPLING TIME	N%	PPm	MEG / 400G SOIL K	EA	MG	P^{11}
	April 2000	0.07	37.t	0.09	0.66	0.12	tt

Materials: Maize (FARZ – 7) and Cowpea collected from the Agricultural Development Project Owerri were used. The maize has adapted to the local conditions and is valued highly for human and livestock consumption because of its high vitamin A content. Hughs and Metcalfe (1972).

Treatment: The treatments whose effects were estimated are:

(i) Baphia alone (ii) Baphia + 1t/ha lime
(iii) Baphia + 2t/ha lime (iv) Cowpea alone
(v) Cowea + 1t/ha lime (vi) Cowpea + 2t/ha lime
(vii) Control.

Experimental Design: A simple randomized complete block design with 4 replications was used. In each experiment there were 7 plots per replication giving a total of 28 plots. Each Baphia – mazie plot contained 6 rows of Baphia stands and 5 rows of maize. Maize population was constant in all plots and cowpea maize plot in addition has 8 rows of cowpea. The stand geometry for Baphia plant was 1m x 1m giving a population of 10,000 stands / ha and cowpea 25 x 40cm with a population of 10,000 stands / ha.

Site Preparation and Treatment Application: The farmland was under one year fallow before the experiment commenced. Before planting all plant growth was weeded manually and removed by hand. This is a common practice among traditional farmers who intercrop without ploughing and is intended to reduce the incidence of disease and pests either carried over from previous years or newly attracted to the residue. During planting Baphia cuttings were planted and allowed to sprout sufficiently before maize was planted. Maize was planted one week after cowpea. Hoeing at 4 and 6 weeks after planting controlled weeds. At harvest maize seeds were weighed and corrected to 14% moisture level before grain yield was calculated.

RESULT

NUMBER OF SEEDS! COB: In both years, the greatest number of seeds per cob was obtained from maize stands grown in mixture with legumes (maize and Baphia) (Baphia maize + Cowpea) respectively, (Table 1 and 2). Grain production was enhanced significantly when the soil was

limed. The stands, which were grown in unlimed plots, did not produce reasonable number of seeds. However the poorest seed development was recorded from maize stands in control plots.

LENGTH PER COB: Maize stands in cowpea plots limed at 1t / ha produced the longest cob, though not significantly different from those grown in Baphia plot at the same rate of liming (1t/ha), (Table 1). In the second year, stands in Baphia plots under 1t/ha of lime produced the longest cobs (Table 2). However, the shortest cob length was recorded from maize stands in control plots, in both years.

SEED YIELD: The seed yield of maize as influenced by different rates of lime and legumes is shown in table I and II. In 2000, the highest seed yield was recoded from maize stands grown in cowpea mixture, (table 1). Seed yield of maize was enhanced with liming. Liming beyond 1/ha per hectare did not improve seed yield further. Maize stands in legume mixture (Cowpea and Baphia) of which soil was not limed gave very poor yield.

Table 1: Seed yield components of maize as influenced by legumes and lime 2000
TREATMENT

Legumes	Lime Rates t/ha	Seed Yield t/ha	No. of Seed/ Cob	Shelling %	Wt/100g Seed	Cob Diameter (cm)	Length/Cob (cm)
Baphia	0	1.29b	155b	43bc	32b	1.83c	4.1c
Baphia	1	2.05b	241a	53b	1.5ab	3.35ab	10.18ab
Baphia	2	2.06b	245a	50b	38.75b	2.73b	9.35b
Cowpea	0	1.76b	148b	46c	34.25b	2.30b	9.73b
Cowpea	1	2.75b	272a	62a	47.00a	3.85a	12.3a
Cowpea	2	1.69a	265a	54b	45.3a	3.00b	11.08ab
Control	0	0.51c	144b	41c	21.3c	1.42c	54c
LSD		0.70	56.4	7.03	9.24	0.83	2.98

In 2001, highest seed yield was recorded from maize stands planted along the alleys of *Baphia nitida* though not statistically significant from those inter cropped with cowpea. Generally maize stands in plots that were not limed gave poor yield (tables 1 and 2). As the fallow species get older, the yield of the companion crop improved progressively.

DISCUSSION

Generally the seed yield of the maize crop especially in the first year (2000) was poor. The area had been under continuous cropping. The P^H 4.4 is an indication that most of the basic nutrients had been depleted due to continuous cropping.

In the first year (2000) the highest seed yield (2.75t/ha) was recorded from maize stands grown in cowpea mixture. Cowpea being a short-term crop tends to fix and release its nitrogen to the companion crop (maize) within a short period, Lawson and Kang (1990). In the second year (2001), their highest seed yield (3.36t/ha) was obtained from stands grown in Baphia alleys. The above trend of increase in maize yield with increase in the age of the hedge plant in this study corresponded with the work of Atta – Krah and Sumberg (1988), which reported that in the third year of cropping. A *Gliricidia sepium* alley system on a degraded ultisol in Nigeria gave 2.42t/ha of maize while control plots yielded 1.74t/ha.

This study thus recorded an increased maize yield from 0.63t/ha in unfertilized control plots to 3.36t/ha in plots mulched with Baphia from 4m wide rows. A similar magnitude of response was obtained by Kang *et al* (1981) with maize yield increase from 1.9t/ha in control plots to 3.5t/ha in plots of *Leaucaena leucocephela* from 4m wide rows. Dofeliz and Nesbitt (1984) in Philippines also recorded increased maize yield with *Leaucaena* at 4m row spacing. Lime application increased the soil P^H from 4 to 4.8 at 1t/ha and 5.2 at 2t/ha per hectare. This increase in PH showed a positive correlation with increase in maize yield. The highest seed yield 3.36t/ha in both trials was recorded when there was lime application of 1t/ha in Baphia plots. This increased seed yield with lime application corresponded with the report of Anyaegbu (1989) which reported an increased maize grain yield from 1.5 t/ha when there is no liming to 3.2t/ha at 1t/ha of lime application in a maize + groundnut mixture. In both trials, the seed yield of maize did not change significantly with increase in lime application from 1t/ha to 2t/ha. Perhaps 1t/ha of lime application may be taken as an optimum level for effective maize production.

Table 2: Seed yield and yield components of maize as influenced by legumes and lime; 2001

TREATMENT							
Legumes	**Lime**	**Seed Yield t/ha**	**No. of Seed/ Cob**	**Wt Grains**	**Shelling %**	**Cob Diameter (cm)**	**Length/Cob (cm)**
Baphia	0	1.45b	202c	38b	42b	2.85b	5.6bc
Baphia	1	3.36b	287ab	44a	68a	3.72a	12.8a
Baphia	2	3.28b	322a	43.9a	64a	3.70ab	12.3a
Cowpea	0	1.14bc	-	188a	36.2b	2.58b	8.3b
Cowpea	1	2.80b	262ab	40.7ab	59a	3.04b	10.1a
Cowpea	2	1.71b	281a	41.1ab	57a	3.12ab	10.2a
Control	0	053d	168c	24.5c	44b	1.85c	3.4c
LSD		053	56.4	7.51	10.1	0.63	3.35

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