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Full Length Research Paper

Productivity of cassava/okra intercropping systems as influenced by okra planting density

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The productivity of cassava (*Manihot esculentus* Crantz)/okra (*Abelmoschus esculentus* L. Moench) intercropping system as influenced by okra planting density (0; 14,000; 28,000; 42,000 and 56,000 plants/ha) in intercropping with cassava (10,000 plants/ha) were investigated in 2000/2001 and 2001/2002 cropping seasons at Umudike, a rainforest location in south-eastern Nigeria. The results showed that sole cassava plants were shorter than the intercrops between 6 to 12 weeks after planting (WAP) in 2000/2001 but throughout the growing period (6 - 48 WAP) in 2001/2002 as okra planting density in the mixture increased. Similarly, sole okra plants were shorter than the intercropped ones. The leaf production and the leaf area index (LAI) of okra were reduced by high okra planting densities intercropped with cassava. The LAI of cassava increased up to 36 WAP and thereafter declined while in okra it declined up to 10 WAP in both years. It was always higher in sole okra than in the intercrops. Intercropping reduced the total number of tubers but the tuber yield was not affected. Intercropping significantly (P< 0.05) reduced the number of fresh pods, pod length and diameter, pod weight per plant and pod yield/ha. Within the intercrops, okra pod yield was not affected by okra planting density in 2000/2001 whereas in 2001/2002 season, 42,000 plants/ha okra plots yielded higher than the other intercrops. The results showed that it was more productive to grow the two crops together as depicted by yield advantages of 25-30% and that there was higher monetary returns in the mixtures. The optimum okra planting density for intercropping with cassava was 42,000 plants/ha as it had the highest yield advantage of 30% in both seasons and gross monetary returns of ₦ 142,000.00 and ₦ 153,900.00 in 2000/2001 and 2001/2002 seasons, respectively.

Key words: Okra (*Abelmoschus esculentus* L. Moench) plant density, cassava (*Manihot esculenta* Crantz), intercropping.

INTRODUCTION

Intercropping, a predominant cropping system in developing countries is the practice of growing two or more crops at the same time during the same season in the same piece of land (Geiler et al., 1991; Willey, 1979). It is a common feature of production in Nigeria (Fawusi, 1985; Muoneke and Asiegbu, 1997). The system has been shown not only to be more efficient than sole cropping (Remison, 1978; Willey, 1979) but also to improve the overall ecology (Adelana, 1984). Cassava, an important carbohydrate staple in Nigeria is gaining importance as an industrial crop in Nigeria and elsewhere. It is an important tuber crop, a major source of energy for man and his livestock and is one of the most dominant and main crop components in crop mixtures in south-eastern Nigeria (Unamma et al., 1985; Ikeorgu and Iloka, 1994).

Okra, which is an important vegetable crop grown in Nigeria for its tender fresh pods rich in vitamins A, B and C and other vital minerals, particularly iodine (Epenhuijsen, 1974; Martin and Ruberte, 1978; Martin, 1982) with seeds that contain 20 - 30% protein, 20 - 21% lipids, 6% ash and a good percentage of vitamin E (Karakoltsides and Constantinides, 1975) is being encouraged in intercropping systems. However, okra yield had been reportted to be very low, about 2 t/ha (Adelana, 1985) due to, among other factors, sub optimal planting density (Fatokun and Chheda, 1983; Muoneke and Asiegbu, 1997).

A number of studies (Ikeorgu et al., 1983; Olasantan, 2005) have shown the importance of vegetables in cassava based farming system. One of the common vegeta-

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bles included in cassava-based mixtures is okra. Ikeorgu et al. (1983) and Olasantan (2005) concluded that cassava and soybean or okra make efficient and compatible mixtures. This could be due to cassava being a long duration crop (9 - 18 months) and being ideal for intercropping with short duration (2 - 3 months) crops, which are often harvested before the cassava canopy closes. Intercropping could result in competition for growth resources when the component crops are in intimate contact, especially with increasing planting density of any of or all the crops in mixture (Muoneke and Asiegbu, 1997).

The aim of this investigation is to determine the okra planting density that will provide additional yield in cassava-based system without reducing cassava yield where cassava is the main crop. The additional yield from the okra crop is to augment some vitamin and mineral requirements in the diet of the people.

MATERIALS AND METHODS

Field experiment were conducted during the 2000/2001 and 2001/2002 cropping seasons at the Michael University of Agriculture, Umudike research farm (05º 29´ N, 07º 33´ E, 122 m above sea level) in the humid rainforest agro ecological zone of south eastern Nigeria to determine the optimum okra planting density in cassava /okra intercropping system. The treatments comprised six density component ratios of 100:0, 100:25, 100:50, 100:75, 100:100, and 0:100 % of cassava and okra, respectively to represent sole cassava, 100% (10,000 plants/ha) at 1.0 m x 1.0 m, sole okra, 100% (56,000 plants/ha) at 1.0 m x 0.18 m, cassava, 100% (10,000 plants /ha) at 1 m x 1 m + okra, 25% (14,000 plants/ha) at 1.0 m x 0.70 m, cassava, 100% (10,000 plants/ha) at 1 m x 1 m + okra, 50% (28,000 plants/ha) at 1.0 m x 0.35 m, cassava, 100% (10,000 plants /ha) at 1 m x 1 m + okra, 75% (42,000 plants/ha) at1.0 m x 0.24 m, cassava, 100 % (10,000 plants/ha) at 1 m x 1 m + okra, 100 % (56,000 plants/ha) at 1.0 m x 0.18 m,

The sole crop plots of cassava and okra were established as controls and for the computation of land equivalent ratio employed for the assessment of the productivity of the systems. The plot size was 6.0 x 4.5 m (27 m^2). Cassava (TMS 30572) collected from the National Root Crops Research Institute, Umudike and an early maturing NHAe 47-4 okra obtained from the National Institute for Horticultural Research, Ibadan were planted same day on 15 August, 2000 and on 22 August, 2001 on 6 m long ridge one meter apart after 20 cm depth soil samples for physicochemical analyses were collected from representative locations of the experimental site. The experiments were laid out in a randomised complete block design and there were three blocks. To reduce variability among cassava planting materials, 20 cm cuttings (with 5 - 7 nodes) cut from 60 - 70 cm of 12 months old stems were used as planting materials. These were planted slanting (45º) on the crest of the ridges, one meter apart at the recommended plant population of 10,000 plants/ha. Okra seeds that were soaked in water for about 24 h (for good germination) and treated with Aldrex T fungicide at the rate of 2 g/kg seed, as recommended by Williams (1975), were sown three per stand midway between the crest and the furrow of the ridges at 0.70, 0.35, 0.24 or 0.18 m, respectively depending on the okra planting density treatment. Supplying missing stands of cassava and thinning okra seedlings to one per stand were done 2 weeks after planting (WAP). Manual hoe weeding was done at 3, 8 and 12 WAP and the ridges remoulded at each weeding. The experimental farm was slashed 26 WAP. Compound fertilizer N: P: K (20:10:10) was applied at the rate of 400 kg/ha by band placement 3 WAP in okra and 8 WAP in cassava plots. Weekly spraying of okra plants with cymbush (cypermethrin EC) insecticide at 600 ml/ha was done starting 10 days after planting for the control of flea beetles (*Podagrica sjostedti* Jack.) and then stopped seven days before harvesting commenced. No spraying was done on cassava, as there was no incidence of pest attack. Okra fruits were harvested at 4 day regular interval from October to late November in 2000 and 2001 whereas cassava was harvested 12 MAP in August 2001 and 2002.

Data on plant height, number of leaves and leaf area index were taken at 6, 18, 36 and 48 WAP in cassava and 6, 8, 10 and 12 WAP in okra. Also total number of tubers per plant, number and weight of marketable tubers and tuber yield of cassava were determined from a net plot area of 6 m^2. The yield and yield components of okra fresh pods taken from five plants sampled randomly from three middle ridges of each plot were number and weight of pods per plant, pod length and diameter and pod yield per hectare.

The data were statistically analysed separately for each crop using the procedure outlined by Gomez and Gomez (1984) for RCBD and significant mean differences were detected by Fishers least significant difference (F-LSD) at $P < 0.05$ according to Carmer and Swanson (1971).

The productivity of the intercropping system was determined by the land equivalent ratio (LER) (the sum of the ratios of the yields of the intercrops to those of the sole crops (Fisher, 1977; Mead and Willey, 1980) and area x time equivalent ratio (ATER) as described by Hiesbsch and McCollum (1987).

ATER = $\{(R_{yo} \times t_o) + (R_{yc} \times t_c)\}/T$. R_{yo} and R_{yc} = relatives of okra and cassava, respectively; t_o and t_c = maturity periods of okra and cassava, respectively. T is the duration of the intercropping system. Monetary equivalent ratio (MER) was determined by the method of Adetiloye (1988). MER = $(r_1 + r_2)/R$, where r_1 and r_2 are monetary returns of component crops in the mixture and R is the higher sole crop monetary return compared with the other.

RESULTS AND DISCUSSION

Soil and weather data

The mechanical and chemical analyses of the soils of the experiment site were sandy loam with acidic reaction (pH 4.6 and 4.7, 1:2.5, soil: water, Ibedu et al., 1988). The soils were low to moderate in nutrient contents (0.06 and 0.05% total nitrogen, 18.0 and 17.3 mg/kg Bray 2 available phosphorus, 0.16 and 0.15 c mol/kg exchangeable potassium and 2.14 and 2.15 % organic matter for 2001 and 2002, respectively, Esu, 1991). The rainfall was high from June to October, 2000 and from April to June, 2001 (Table 1). The highest total annual rainfall (2352.4 mm) was in 2002 while the lowest (1680.6 mm) was in 2000. The value for 2001 was 2208.0 mm. The 10 year mean annual rainfall (1883.3 mm) was higher than the 2000 annual value but lower than those of 2001 and 2002.

Cassava growth

Plant height, number of leaves and LAI of cassava were significantly affected by intercropping in both seasons (Figure 1). Cassava plants were significantly ($P<0.05$) shorter at 6-12 WAP in sole than in intercrop with okra, especially at higher okra planting density. The results corroborated that of Ikeorgu et al. (1984) in complex mixtures involving cassava, maize, okra and melon as well

Table 1. Meteorological data of the site during the period of the experiments.

	Rainfall (mm)				Mean ambient temperature (° C)			
	2000	2001	2002	10-yr mean	2000	2001	2002	10-yr mean
Jan	14.8	0.0	3.1	20.0	28.0	26.5	26.5	27.1
Feb	0.9	7.8	107.1	31.1	28.0	28.5	28.0	28.4
Mar	13.6	175.9	68.5	96.2	29.0	28.5	28.5	28.5
Apr	164.5	224.1	259.0	195.1	28.5	27.0	28.0	28.1
May	153.6	194.3	436.3	294.4	28.0	27.5	28.0	27.6
Jun	265.5	522.5	240.1	303.6	27.0	26.5	26.5	26.7
July	265.2	273.5	359.8	298.3	26.5	25.5	26.5	26.0
Aug	216.9	179.0	333.7	326.5	27.0	25.0	25.5	25.9
Sept	277.5	317.2	238.5	336.3	27.0	25.5	25.5	25.8
Oct	228.4	277.1	248.5	298.4	27.5	26.5	26.0	26.1
Nov	75.9	18.6	57.8	54.9	28.0	27.5	27.5	27.1
Dec	3.8	0.0	0.0	5.1	26.5	27.0	27.0	26.7
Total	1680.6	2208.0	2354.4					

Source: National Root Crops Research Institute, Umudike, Umuahia, Nigeria Agro meteorological Station.

as Ofori and Stern (1987) and Watiki et al. (1993) in maize/cowpea intercrops. Cassava plant height increased with all the sampling ages in 2000/2001 and 2001 / 2002.

Increasing the population density of okra up to 56,000 plants/ha in the intercrop progressively increased plant height but decreased the number of leaves per plant and the LAI of cassava in both years. This agrees with the results obtained by Olasantan and Aina (1987) in okra intercropping and Muoneke and Asiegbu (1997) in maize /okra mixture that high population densities induced higher plant height and reduced number of leaves and LAI of component crops, probably because of competition for light and other resources.

Irrespective of the plant population, the number of leaves per plant and LAI of cassava always increased with time up to 36 WAP after while LAI declined thereafter in spite of increased number of leaves per plant. The decline in LAI could be due to a reduction in the surface leaf area of the cassava plant even with more leaf production. Also, the leaf size may have contributed to the reduction in the interception of solar radiation, hence resulting in poor growth. More so, much of the assimilate were being transferred to the tuberous roots (sinks). The trend was the same in the two seasons.

Cassava yield and yield components

The number of tubers per plant (marketable and unmarketable), weight of fresh tubers per plant and tuberous root yield of cassava were not affected by intercropping in both cropping seasons (Table 2). Fresh tuber yield and yield components of sole cassava were not significantly affected by intercropping. Among the intercrops in the two cropping seasons, total number of tubers per plant, and especially, number of unmarketable tubers increased with increase in okra plant population under the additive mixture series. Conversely, there was a decrease in the number and weight of marketable tubers per plant as well as tuber yield of cassava per hectare as okra plant density increased from 14,000 plants/ha to 56,000 plants /ha. The situation can be attributed to competition for growth resources, which was intensified at high densities of okra in cassava plots. The trend was similar in both cropping seasons. The non-significant effect of okra plant density on the yield of cassava could be due to early maturity of the component crop (okra), hence cassava had enough time to compensate for losses suffered once the competition for growth resources from okra was removed. Ezumah and Namky (1984) and Ikeorgu, et al. (1989) reported similar results in complex crop mixtures involving cassava/maize/okra/melon intercropping systems, respectively.

Okra growth characteristics

In 2000/2001 and 2001/2002, plant height, number of leaves per plant and leaf area index of okra showed significant ($P<0.05$) responses to intercropping (Figure 2). Okra plants were taller due to struggle for light, had fewer number of leaves per plant and smaller LAI as a result of inter specific competition for growth resources when intercropped with cassava than when they were planted sole. Similar situations were reported by Fawusi (1985) in maize/okra and Omotunde (1996) in okra/cowpea. These response variables increased with age. Number of leaves per plant and LAI increased and peaked at 10 WAP and thereafter declined as a result of leaf death associated with senescence in the two seasons.

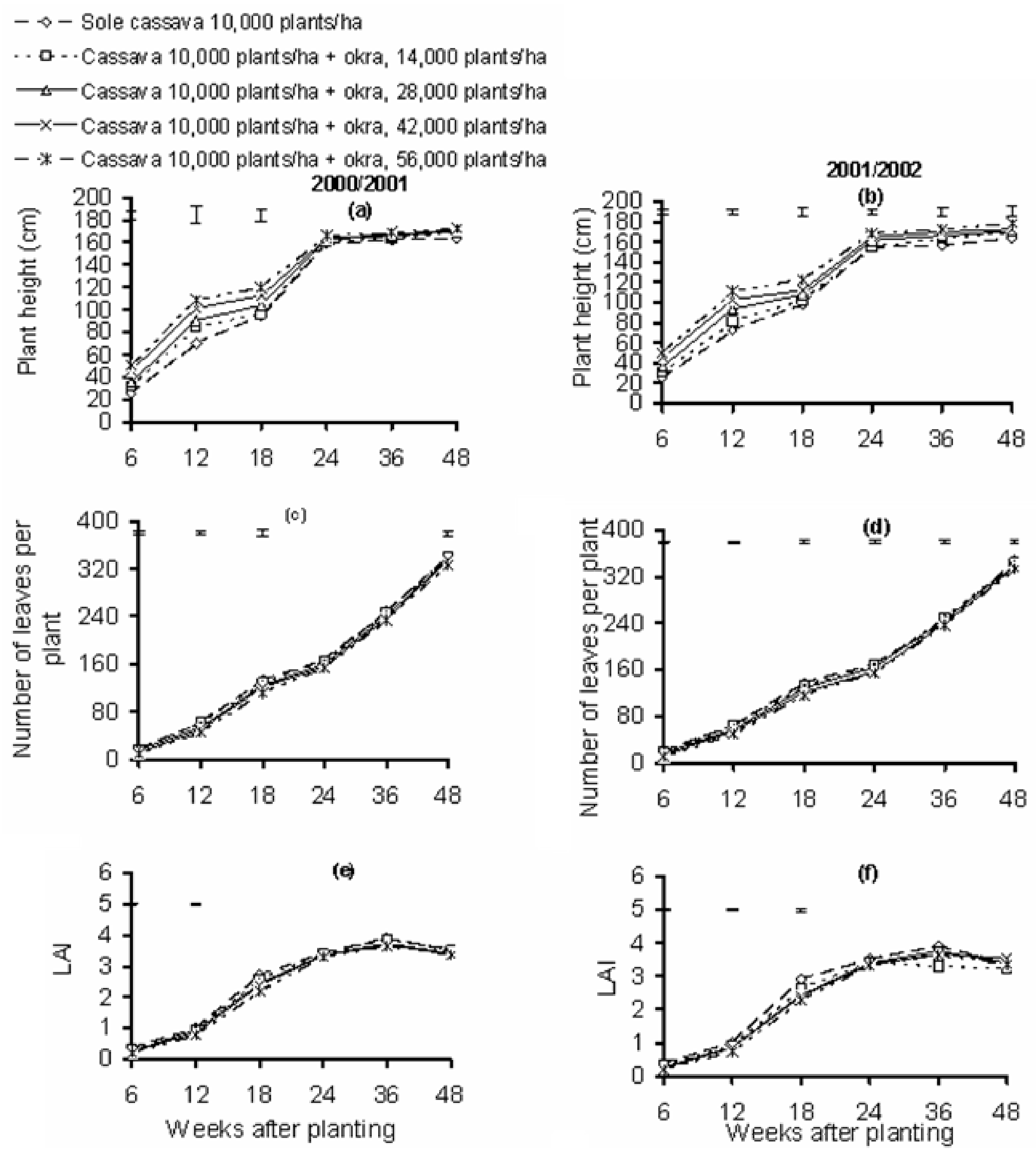

Figure 1. Effects of Okra plant population on plant height (a and b), number of leaves per plan (c and d) and LAI (e and f) in sole and intercropped cassava at various sampling ages of growth in 2000/2001 and 2001/2002 cropping seasons at Umudike. Vertical bars indicate LSD $_{0.05}$.

The lowest plant height occurred with the lowest plant population while the lowest leaf production and LAI were observed at the highest okra plant population in the intercrop in both seasons. Ariyo et al. (1991) and Muoneke and Asiegbu (1997) obtained similar results in experiments involving plant population of okra in intercropping situations. The LAI of okra reached a maximum at 42,000 plants/ha in the mixture and thereafter declined with further increase in the density of okra. The increase in LAI as plant population increased was in agreement with the finding Muoneke (1995). The growth response variables of okra, which were reduced in the intercropping, might be due to intra- and inter-specific competition between cassava and okra for light and space. This agreed with the report of Palaniappan (1985) that taller component crops in an intercropping situation have the advantage to intercept more light such that the growth rates of the two component crops would be proportional to the quantity of the PAR they intercepted. Also, at lower population density, interception of total solar radiation may be low due to reduced number of plants per unit area even though interception efficiency by a plant may increase.

Okra yield and yield components

The number of fresh pods per plant, length and diameter of fresh pod, weight per pod, fresh pod weight per plant as well as fresh pod yield per hectare were significantly (P<0.05) reduced by intercropping in the two cropping

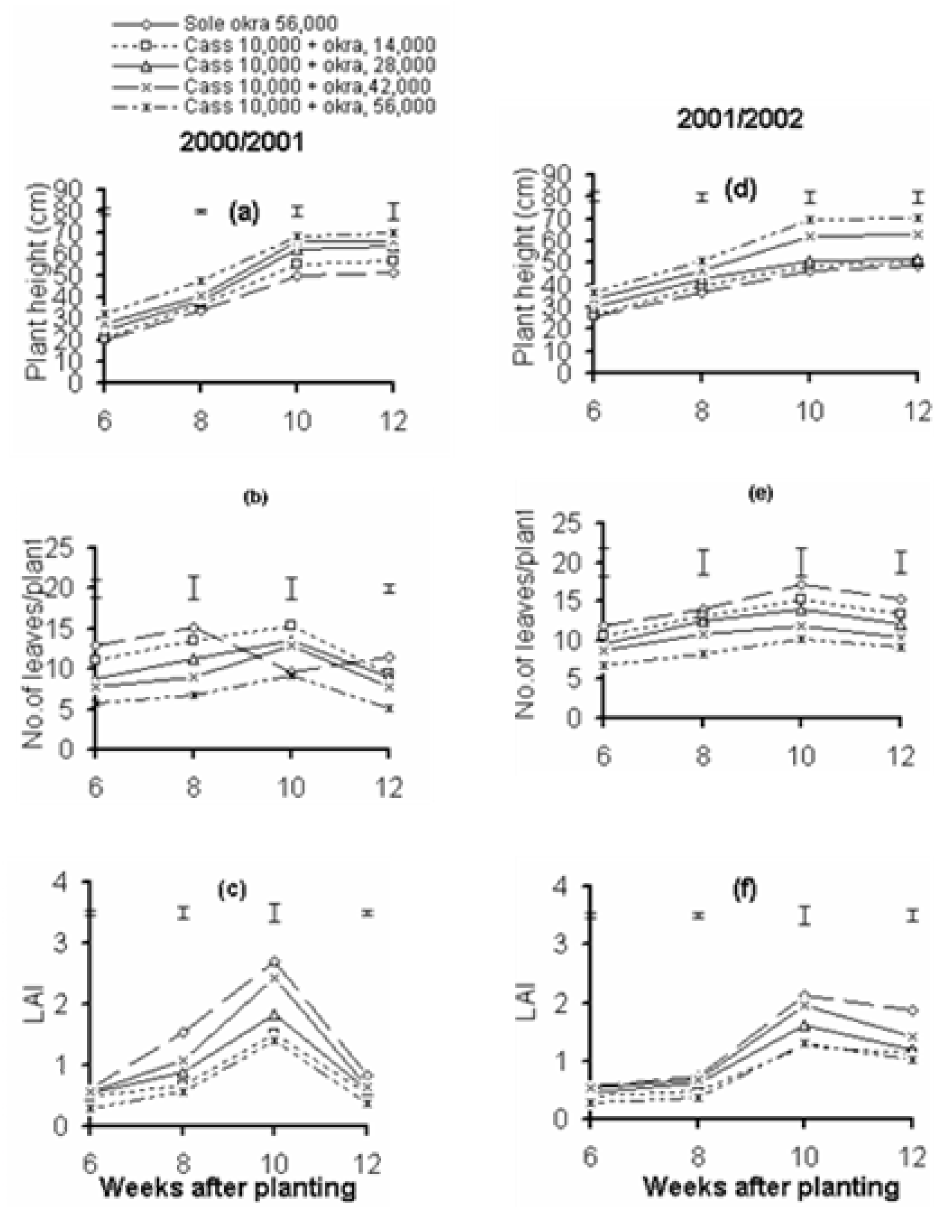

Figure 2. Effects of okra plant population on plant height (a and d), number of leaves per plant (b and e) and LAI (c and f) in sole and intercropped okra at various ages of growth in 2000/2001 and 2001/2002 cropping seasons. Vertical bars indicate $LSD_{0.05}$ error of the mean cropping seasons at Umudike.

seasons (Table 3). Sole okra gave the highest fruit yield compared to intercropping because of less inter-specific competition among the crops as well as higher aggregate population density per unit area observed in the intercrop. This agrees with the report of Ofori and Stern (1987) in a range of planting densities involving maize and cowpea intercrops, Omotunde (1996) in okra/cowpea and Babatunde (2000) in okra-celosia mixtures.

Among the intercrops in 2000/2001 and 2001/2002, yield and yield components of okra such as the number of fresh pods per plant, length and diameter of fresh pod, weight per fresh pod and fresh pod yield decreased as the okra plant population increased. This may be due to stiff competition for growth resources in high-density plantings. However, fresh pod yield per hectare increased ($P<0.05$) with increase in okra plant population and peaked at 42,000 plants/ha. No further increase was observed with further increase in plant population. Similar results were reported by Lee and Leong (1979) in some okra cultivars and Olasantan and Aina (1987) in okra / cowpea as well as Muoneke and Asiegbu (1997) in okra / maize mixtures. Furthermore, Willey and Heath (1969) as

Table 2. Effect of okra plant population on fresh tuber yield and yield componentsof cassava in cassava/okra intercrops in 2000/2001 and 2001/2002.

Treatment	Total No. of tubers per plant	Number of Marketable tubers per plant	Number of unmarketable tubers per plant	Weight of fresh tubers (kg/plant)	Fresh tuber yield (t/ha)
2000/2001					
Sole cassava, 10,000 plants/ha	7.57	5.64	1.93	2.14	21.4
Cassava, 10,000 plants/ha + okra, 14,000 plants/ha	6.43	3.75	2.68	2.06	20.6
Cassava, 10,000 plants/ha + okra, 28,000 plants/ha	5.25	3.82	1.43	2.00	20.0
Cassava, 10,000 plants/ha + okra, 42,000 plants/ha	5.02	2.79	2.23	1.95	19.5
Cassava, 10,000 plants/ha + okra, 56,000 plants/ha	4.86	3.86	1.00	1.87	18.7
F-LSD (0.05)	2.5	1.5	ns	ns	ns
2001/2002					
Sole cassava, 10,000 plants/ha	7.24	5.48	1.76	2.06	20.6
Cassava, 10,000 plants/ha + okra, 14,000 plants/ha	6.02	3.57	2.45	1.98	19.8
Cassava, 10,000 plants/ha + okra, 28,000 plants/ha	5.48	3.92	1.56	1.92	19.2
Cassava, 10,000 plants/ha + okra, 42,000 plants/ha	4.85	4.16	0.69	1.85	18.5
Cassava, 10,000 plants/ha + okra, 56,000 plants/ha	4.21	3.19	1.02	1.71	17.1
F-LSD (0.05)	2.4	0.7	1.0	0.3	2.7

well as Weiner and Thomas (1986) demonstrated that at higher crop densities more of the total yield could be found in structural tissues, and less in reproductive tissues or other harvestable components. The low pod yield per plant observed under increased okra densities was compensated for by more number of plants per unit area which collectively contributed to the overall yield to produce a greater yield per hectare than under low plant densities.

Increasing okra planting density above the optimum (42,000 plants/ha) resulted in lower yield because many plants did not produce pods as a result of inter plant competition thereby reducing economic yield at the highest okra planting density, especially in intercropping situation.

Productivity of the intercropping system

The LER of the cassava with okra intercrops were all above 1.00 (Table 4). The yield advantages ranged from 10 to 30% (2000/2001) and 7 to 30% (2001/2002). Averaged over the two seasons, the highest LER of 1.30 and the least of 1.09 were obtained when cassava was intercropped with okra at 42,000 plants/ha and 56,000 plants/ha, respectively. The productivity of cassava/okra intercropping as determined by total LER, in all combinations, was superior in resource use efficiency compared to growing the two crops separately.

The ATER in the intercrop ranged from 0.92 to 1.02 (2000/2001) and from 0.57 to 0.83 (2001/2002). The values were generally lower when compared with the LER at equivalent plant populations perhaps due to the wide variations in the maturity periods of the two crops of which cassava stayed longer on the land and had enough time to compensate for the okra competition.

Cassava generally was more competitive than okra in the intercrop. The competition coefficient of cassava decreased as okra plant density increased up to 42,000 plants/ha and thereafter increased with further increase in plant density up to 56,000 plants/ha. The trend was the same in both seasons with the highest competition coefficient in cassava obtained at the lowest intercrop population of okra at 14,000 plants/ha. The reverse was the case in okra in the two cropping seasons. These observations are consistent with those reported in cassava / cowpea intercrop system by Olasantan (1993).

Willey (1979) observed that practical significance of productivity in intercropping could only be fully assessed when related to the actual economic or monetary returns. In this study, gross monetary returns (₦142, 000 in 2000 /2001 and ₦ 153,900 in 2001/2002) were highest when okra was intercropped at 42,000 plants/ha with cassava but lowest with the sole crops.

Table 3. Effect of okra plant population on yield and yield components of okra in cassava/okra intercrops in 2000/2001 and 2001/2002

Treatment	Number of fresh pods per plant	Length of fresh pod (cm)	Diameter of fresh pod (cm)	Weight per fresh pod(g)	Fresh pod yield g/plant)	Fresh pod byield (t/ha)
2000/2001						
Sole okra, 56,000 plants/ha	6.67	7.44	5.88	12.07	80.51	4.51
Cassava, 10,000 plants/ha + okra, 14,000 plants/ha	6.54	6.81	4.45	11.74	76.78	1.07
Cassava, 10,000 plants/ha + okra, 28,000 plants/ha	6.20	6.65	3.28	8.26	51.21	1.43
Cassava, 10,000 plants/ha + okra, 42,000 plants/ha	5.55	5.04	2.97	7.63	42.35	1.78
Cassava, 10,000 plants/ha + okra, 56,000 plants/ha	3.83	4.08	2.70	4.92	18.84	1.05
F-LSD (0.05)	1.9	2.7	1.8	3.2	21.1	1.4
2001/2002						
Sole okra, 56,000 plants/ha	7.43	6.13	3.93	8.72	64.70	3.62
Cassava, 10,000 plants/ha + okra, 14,000 plants/ha	6.65	5.92	2.93	7.52	50.01	0.70
Cassava, 10,000 plants/ha + okra, 28,000 plants/ha	6.23	4.08	2.81	6.79	42.30	1.18
Cassava, 10,000 plants/ha + okra, 42,000 plants/ha	5.68	3.60	2.74	5.99	34.02	1.43
Cassava, 10,000 plants/ha + okra, 56,000 plants/ha	3.75	2.85	2.41	4.15	15.56	0.87
F-LSD (0.05)	2.00	1.9	1.1	2.5	12.8	

Table 4. Land equivalent ratio, area x time equivalent ratio, competition coefficient and gross monetary returns as influenced by okra plant population in cassava/okra intercrop in 2000/2001 and 2001/2002.

Treatment	Land equivalent ratio Partial			Area x time equivalent ratio	Competition coefficient (C)		Gross monetary return (N/ha) Partial		
	Cassava	Okra	Total		Cassava	Okra	Cassava	Okra	Total
2000/2001									
Sole cassava, 10,000 plants/ha	1.00	-	1.00	-	-	-	107,000	-	107,000
Sole okra, 56,000 plants/ha	-	1.00	1.00	-	-	-	-	112,750	112,750
Cassava, 10,000 plants/ha + okra, 14,000 plants/ha	0.96	0.24	1.20	1.02	0.80	0.20	103,000	26,750	129,750
Cassava, 10,000 plants/ha + okra, 28,000 plants/ha	0.93	0.32	1.25	1.00	0.74	0.26	100,000	35,750	135,750
Cassava, 10,000 plants/ha + okra, 42,000 plants/ha	0.91	0.39	1.30	1.00	0.70	0.30	97,500	44,500	142,000
Cassava, 10,000 plants/ha + okra, 56,000 plants/ha	0.87	0.23	1.10	0.92	0.79	0.21	93,500	26,250	119,750
2001/2002									
Sole cassava, 10,000 plants/ha	1.00	-	1.00	-	-	-	123,600	-	123,600
Sole okra, 56,000 plants/ha	-	1.00	1.00	-	-	-	-	108,600	108,600
Cassava, 10,000 plants/ha + okra, 14,000 plants/ha	0.96	0.19	1.15	0.57	0.83	0.17	188,800	21,000	139,800
Cassava, 10,000 plants/ha + okra, 28,000 plants/ha	0.93	0.33	1.26	0.75	0.74	0.26	115,200	35,400	150,600
Cassava, 10,000 plants/ha + okra, 42,000 plants/ha	0.90	0.40	1.30	0.83	0.69	0.31	111,000	42,900	153,900
Cassava, 10,000 plants/ha + okra, 56,000 plants/ha	0.83	0.24	1.07	0.60	0.78	0.22	102,600	26,100	128,700

Cassava and okra were at prevailing market prices of ₦5/kg and ₦25/kg, respectively in 2000/2001 and ₦6/kg and ₦30/k in 2001/2002 respectively.NS = Not significant at 5% level of probability

Conclusion

The results confirmed that a subsidiary diet rich vegetable crop such as okra can be introduced into a cassava plot and that the level of complementarities between the crop species is very high. The intercropping farmer achieves not only the full production of the base crop (cassava) but also an additional yield bonus associated with an increased plant population of the okra component. For maximum productivity and GMR of component crops, optimum population of main crop (cassava at 10,000 plants/ha) plus one third of optimum population of component crop (okra at 42,000 plants/ha) is recommended in cassava/okra intercrop.

The applicability of the cropping system reported here is that it inexpensive system involving only the expedience of growing the two crops together.

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