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Performance of Growth and Yield of Rice (*Oryza sativa* L.) Varieties in a Cassava (*Manihot esculenta* Crantz)/Rice Intercrop in the South West Nigeria

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Abstract: A field trial was conducted at the Teaching and Research Farm of the University of Agriculture, Abeokuta (latitude 7°15 N' and longitude 3°25 E') located in the forest-savanna transition zone of South West Nigeria in 2002 and 2003 to assess the agronomic growth and yield of intercropping cassava and rice. The treatments consisted of two cassava cultivars and three rice varieties in a randomized complete block design with three replications. The two cassava cultivars were TMS 30572 and TME 1 and the three rice varieties were interspecific hybrid WAB 189-B-B-B-6-HB, ITA 150 and ITA 321. In 2002, cropping system had no significant effects on growth parameters of rice varieties. However, in 2003, cropping system significantly decreased the number of tillers, but increased the panicle length of rice. Cropping system significantly decreased the number of grains per panicle in 2003 and grain yield of rice in both years. The grain yield of rice was significantly correlated with number of tillers (r = 0.83), LAI (r = 0.81) and number of panicles per hill (r = 0.91) in both years. In 2002, tuber yields of the two cassava cultivars in mixtures were similar to the yields of their corresponding sole crop plants. However, in 2003, sole cassava cvs TMS 30572 and TME 1 produced significantly 26 and 23% higher tuber yield than their corresponding intercrops. In 2002 and 2003, TMS 30572 produced 35 and 25 t ha^{-1} while TME 1 produced 27 and 17 t ha^{-1} tuber yield, respectively, in mixtures.

Key words: Intercropping, agronomic attributes, morphotypes, cassava, rice, yield attributes

INTRODUCTION

Intercropping is the growing of two or more crop species simultaneously in the same field during a growing season. The practice of growing several crops on the same piece of land is an ancient strategy for crop production among farmers in the tropics. Traditionally, it is used by subsistence farmers primarily to increase the diversity of their products (Gomez and Gomez, 1983).

Rice (*Oryza sativa* L.) is the most important food crop of the tropical world (Prsasad *et al*., 1999). In Nigeria, rice is the sixth major crop in cultivatable area after sorghum (*Sorghum bicolor*), millet (*Pennisetum* sp.), cowpea (*V. unguiculata*), maize (*Zea mays*) and cassava (*Maninhot* sp.) (Ukwungwu, 2000). It is estimated that 4.6 million hectares could be put into rice cultivation in the country, but only an estimated 1.9 million hectare are currently utilized and a total of 3.3 million tons of rice was produced in 1998 compared to 0.7 million tones in 1978 (Ukwungwu, 2000). Farmers intercrop cassava usually with vegetables, plantation crops (such as coconut (*C. nucifera*), coffee (*Coffee* sp.), yam (*Dioscorea* sp.), sweet potato (*Ipomea batatas*), melon, maize, groundnut (*A. hypogea*) and other legumes. Intercropping patterns depends on environmental conditions and food

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preferences of the region (IITA, 1990; Kapinga *et al*., 1995). In simple mixtures (consisting of only two crops), farmers select arable crops on the basis of differences in growth habit and time of maturity. Intercropping of annuals with other annuals or perennial crops is widely practiced by Nigerian peasant farmers.

Cassava is one of the most important food crops in Africa. More than 50% of the world cassava production is in Africa and Nigeria is currently the largest world producer of cassava with an annual production of over 34 million tonnes of tuberous roots (IITA, 2003). The crop was rapidly adapted by African farmers and integrated into the traditional farming systems because of its low input resource requirements and relative ease of cultivation and processing (Hahn *et al*., 1979). The contention that comparison between cassava growing environments and actual cassava distribution in Nigeria and Ghana demonstrates that the distribution of cassava could be primarily a function of population density rather than of agro-ecological consideration (Stoorvogel and Fresco, 1991). A recent survey of the cassava-growing areas shows that in more than 90% of the 65 representative villages, the farmer group respondents reported an increasing trend in cassava production over the 20 years prior to the interview in 1989 (Nweke *et al*., 1997; Ugwu, 1996). Cassava production was reported to be increasing among villages where cassava, yam, rice, beans, or peas, were the most important crops in cropping system (Ugwu, 1996). Today 60% of the area cropped with cassava in Nigeria is planted with improved varieties (IITA, 2003). Cassava is grown in association with several other crops in most African countries. Rice/cassava intercrop has not been found to be a common practice of some farmers in the derived savanna zone of the country. There is therefore, the need to study how improved rice varieties, particularly the NERICA would perform when intercropped with cassava cultivars.

MATERIALS AND METHODS

Description of Experimental Site

The experiment was conducted at the Teaching and Research Farm of the University of Agriculture, Alabata, Abeokuta, (Latitude 7°15'N and Longitude 3°25'E) between July and November in 2002 and May and September in 2003. The locations used in both years were contiguous. The pre-planting soil analysis for 2002 site showed that pH was 5.22, organic carbon 1.24%, organic matter content 2.14%, total N 0.31%, P 0.601 (ppm) and K 1.71 (mol kg^{-1}). The 2003 soil analysis was, soil pH of 5.67, organic carbon 1.01%, organic m atter 1.70%, total N 0.16%, P 0.466 (ppm) and K 1.33 (mol kg^{-1}).

Experimental Design and Treatments

The trial consisted of eleven treatments arranged in a randomized complete block design replicated three times. The treatments consisted of three sole rice varieties (ITA 321, ITA 150 and WAB 189-B-B-HB), two sole cassava varieties (TMS 30572 branching and TME 1 non-branching) and six intercrop combinations of the two component crops. The cassava varieties were planted two weeks after rice. ITA 321 is a late maturing *Oryza sativa* cross; ITA 150 is an early maturing *Oryza sativa* cross while WAB 189-B-B-B-6-HB is an early maturing interspecific rice hybrid of *Oryza glabberima* × *Oryza sativa* cross.

Crop Husbandry

The field was disc ploughed and disc harrowed fourteen days later. Plot size was 9×6.4 m, each plot was separated by a discard area of 0.5 m. The rice plots were sown with about 6-7 seeds per hole by dibbling on 13 July 2002 at a spacing of 30x30 cm and later thinned to four seedlings per hill. The missing hills were supplied in order to ensure a target plant population per unit area. Each plot consisted of 31 rows of rice with 22 hills per row, corresponding to 682 hills per plot with a total plant population of 2728 plants per plot (4 plants per hill). This corresponded to 444,444 plants ha^{-1}.

In mixed stands, a constant arrangement of one row of cassava bordering two rows of rice with rows 30 cm apart were used. Cassava was planted at 0.9×0.9 m, giving a cassava population of 71 plants per plot, corresponding to 12,346 cassava plants per hectare.

A basal fertilizer application of 30 kg N ha^{-1}, 30 kg P ha^{-1} and 30 kg K ha^{-1} compound fertilizer (15-15-15) was done two weeks after planting rice using the broadcasting method. Also, top dressing with urea (30 kg Nha^{-1}) by banding was done at panicle initiation 8 WAP. Weeding was done three times before harvesting rice at 3, 6 and 9 weeks after planting. After harvesting rice, cassava plots were weeded as necessary. The experiment was repeated in 2003 with planting carried out on 23 May, 2003 following the same procedure adopted in 2002.

Determination of Leaf Area for Rice and Cassava

Leaf area index for rice was done using a technique by Gomez (1972), while leaf area for cassava was determined using the non-destructive method at every four weeks for a total of three months.

RESULTS

Plant Height and Leaf Area Index of Rice

Intercropping had no significant effects on plant height and leaf area index of rice in 2002 and 2003 cropping seasons (Table 1). There were also no significant differences in plant height of rice

Table 1: Plant height and leaf area index of rice in sole crop and intercropping with cassava in 2002 and 2003

	Plant height						Leaf area index					
	2002			2003			2002			2003		
	4	8	12	4	8	12	4	8	12	4	8	12
Treatments	WAS											
Sole crop rice												
WAB 189-B-B-B-6-HB	35.6	68.0	87.4	37.6	87.4	106.7	0.4	1.1	1.8	0.4	2.5	3.4
ITA 150	38.6	72.8	94.9	37.6	84.4	113.3	0.2	1.1	1.9	0.3	1.9	2.1
ITA 321	31.3	68.3	89.8	35.5	80.5	107.0	0.4	1.3	3.5	0.5	2.6	3.6
Rice intercrop												
TMS 30572/WAB 189-B-B-B-6-HB	38.3	77.5	94.5	34.2	85.9	102.4	0.3	1.4	2.0	0.4	1.9	2.2
ITA 150	38.3	72.1	98.9	38.3	84.7	117.1	0.2	1.2	2.1	0.3	1.5	1.7
ITA 321	30.0	75.0	96.2	32.6	80.0	107.3	0.2	1.4	3.1	0.4	2.6	3.7
TME 1 /WAB 189-B-B-B-6-HB	29.6	69.6	87.4	32.8	82.4	120.6	0.1	1.1	1.7	0.4	1.9	3.0
ITA 150	34.0	77.0	99.2	38.1	91.1	117.1	0.2	1.1	1.9	0.4	1.7	1.8
ITA 321	29.3	71.0	89.4	34.6	83.6	97.0	0.4	1.3	2.8	0.5	2.6	4.6
Cropping system X Rice (LSD 5%)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sole crop rice (mean)	35.2	69.7	90.7	36.4	84.1	109.0	0.3	1.4	2.4	0.4	2.3	3.0
TMS 30572/ Rice (mean)	35.5	74.8	96.5	35.0	81.9	108.9	0.3	1.2	2.1	0.4	2.1	2.5
TME 1/Rice (mean)	31.0	72.5	92.0	35.2	85.7	111.6	0.3	1.2	2.4	0.4	1.9	3.1
Cropping system (LSD 5%)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
WAB 189-B-B-B-6-HB (mean)	34.5	71.7	89.8	34.8	83.6	109.9	0.3	1.2	1.38	0.4	2.1	2.9
ITA 150 (mean)	37.0	74.0	97.6	38.0	86.7	115.9	0.2	1.2	1.9	0.3	1.7	1.9
ITA 321 (mean)	30.2	71.4	91.8	34.2	81.4	103.8	0.4	1.3	3.1	0.5	2.6	3.9
Rice varieties (LSD 5%)	NS	NS	5.9	2.5	3.9	9.5	NS	NS	0.5	0.07	0.63	0.84
CV (%)	19.4	12.4	6.3	7.0	4.6	8.7	78	20.0	22.9	19	29.3	29.1

WAS = Weeks after sowing; NS = Not Significant

varieties in 2002 except at 12 WAS where ITA150 was the tallest (97.6 cm). while WAB-B-B-B-6-HB was the shortest (89.8 cm). ITA 321 had the highest leaf area index (3.1) while WAB-B-B-B-6-HB had the smallest (1.4) at 12 WAS in 2002. The rice varieties exhibited significant varietal differences in plant height and leaf area index in 2003. ITA 150 (38.0, 86.7 and 115.9 cm) grew taller than WAB-B-B-B-6-HB (34.8, 86.6 and 109.9 cm) and ITA 321 (34.2, 81.4 and 103.8 cm) at 4, 8 and 12 WAS while ITA 321 had the highest leaf area index of 0.5, 2.6 and 3.9 compared with WAB-B-B-B-6-HB (0.4, 2.1 and 2.9) and ITA 150 (0.3, 1.7 and 1.9) at 4, 8 and 12 WAS, respectively.

Number of Tillers per Hill, Number of Days to 50% Flowering, Number of Days to 95% Maturity and Number of Panicles per Hill of Rice

Cropping system had no significant effects on number of tillers per hill, number of days to 50% flowering, number of days to 95% maturity and number of panicles per hill of rice in 2002 (Table 2). Among rice varieties, ITA 321 had the highest number of tillers (13, 27 and 40) in 2002 and (17, 29 and 35) in 2003 at 4, 8 and 12 WAS, respectively. In 2003, cropping system had significant effect on

Table 2: Number tillers per hill, number of days to 50% flowering, number of days to 95% maturity and number of panicles per hill of rice in sole crop and intercropping with cassava in 2002 and 2003

	No. of tillers per hill											
	2002			2003			No. of days to 50% flowering		No. of days to 95% maturity		No. of panicles/ hill	
	4	8	12	4	8	12						
Treatments	WAS						2002	2003	2002	2003	2002	2003
Sole crop rice												
WAB 189-B-B-B-6-HB	8	16	24	12	25	33	89	75	118	111	8	11
ITA 150	6	12	18	10	21	25	82	67	107	105	8	9
ITA 321	16	32	48	19	31	38	96	90	127	120	21	12
Rice intercrop												
TMS 30572/WAB 189-B-B-B-6-HB	9	18	28	14	21	21	78	75	114	111	10	9
ITA 150	6	12	18	8	18	24	78	67	111	105	7	9
ITA 321	12	25	38	16	27	31	95	90	127	120	15	13
TME 1/WAB 189-B-B-B-6-HB	8	16	24	15	24	35	82	75	122	111	8	12
ITA 150	10	20	30	12	21	25	82	67	107	105	7	9
ITA 321	11	22	34	16	28	36	96	91	121	120	15	14
Cropping system X Rice (LSD 5%)	NS	NS	NS	NS	NS	5.0	NS	NS	NS	NS	NS	NS
Sole crop rice (mean)	10	20	30	14	25.6	32	89	77.3	117	112.0	12	11
TMS 30572/ Rice (mean)	9	19	28	13	22.0	25	84	77.3	117	112.0	11	10
TME 1/Rice (mean)	10	20	29	14	24.4	32	87	77.7	117	112.0	10	12
Cropping system (LSD 5%)	NS	NS	NS	NS	NS	3	NS	NS	NS	NS	NS	NS
WAB 189-B-B-B-6-HB (mean)	8	17	24	14	23	30	83	75.0	118	111	9	11
ITA 150 (mean)	7	15	22	10	20	25	81	67.0	108	105	7	9
ITA 321 (mean)	13	27	40	17	29	35	96	90.4	125	120	17	13
Rice varieties (LSD 5%)	4	7	11	2	2	3	7	0.7	NS	0.003	4	NS
CV (%)	37	37	37	17	14	10	8	0.9	6	0.001	36	21

WAS = Weeks After Sowing; NS = Not Significant

number of tillers per hill at 12 WAS. Sole rice and TME 1/Rice had 32 each while TMS 30572/Rice had 25 number of tillers per hill, respectively. ITA 321 also had the highest number of days to 50% flowering (96 and 90.4), number of days to 95% maturity (125 and 120) and number of panicles per hill of rice (17 and 13) in 2002 and 2003, respectively. TMS 30572 significantly reduced the number of tillers of rice in 2002 and 2003 when compared with TME 1 and sole rice at 4, 8 and 12 WAS. The interaction between cropping system and rice was not significant in 2002 but had significant effect on number of tillers per hill at 12 WAS in 2003.

Yield and Yield Components of Rice

Intercropping had no effect on panicle length, number of grains per panicle, 1000 grain weight but significantly reduced the grain yield and harvest index of rice (Table 3). Sole rice yielded higher 2504 and 2645 kg ha^{-1} with harvest index of 33.6 and 23.2 while TMS 30572/Rice and TME 1/Rice yielded lower (1956 and 1859 kg ha^{-1}) and (1951 and 2198 kg ha^{-1}) with harvest index of (23.6 and 18.5) and (29.5 and 21.5) in 2002 and 2003, respectively. ITA 321 produced the longest panicle (27.2 cm and 23.4 cm), number of grains per panicle (136 and 150) and the highest grain yield of 2628 and 3029 kg ha^{-1} in 2002 and 2003 cropping seasons. The number of grains per panicle (136) compensated for the lowest (30.8) 1000 grain weight recorded in 2002. In both years ITA 321 and WAB-B-B-B-6-HB performed better than ITA 150.

Table 3: Panicle length, number of grains/panicle, 1000 grain weight, grain yield and Harvest index of rice in sole crop and intercropping with cassava in 2002 and 2003

	Panicle length (cm)		No. of grains/ panicle		1000 grain weight (g)		Grain yield (kg/ha)		Harvest index (%)	
Treatments	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
Sole crop rice										
WAB 189-B-										
B-B-6-HB	26.2	21.4	100	156	34.8	34.2	2102	2617	34.1	22.6
ITA 150	24.5	20.4	90	133	35.1	33.1	1964	1754	31.6	22.5
ITA 321	27.8	22.6	131	186	31.5	35.1	3448	3563	35.3	24.5
TMS 30572/										
WAB 189-B-										
B-B-6-HB	24.2	23.2	115	153	34.8	32.2	2026	1609	19.8	22.9
ITA 150	22.0	21.8	90	103	34.9	33.8	1664	1554	24.3	15.8
ITA 321	27	23.2	144	139	30.5	34.3	2177	2413	26.9	16.8
TME 1 /WAB										
189-B-B-B-6-HB	22.7	23.3	89	114	34.0	30.6	1873	1902	34.6	22.4
ITA 150	22.1	20.5	93	100	35.0	34.0	1723	1580	25.0	19.7
ITA 321	27.0	24.6	133	125	30.5	34.4	2258	3112	28.8	22.3
Cropping system										
X Rice (LSD 5%)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sole crop rice										
(mean)	26.1	21.5	107	158	33.8	34.1	2504	2645	33.6	23.2
TMS 30572/										
Rice (mean)	24.2	22.7	116	132	33.4	33.4	1956	1859	23.6	18.5
TME 1/Rice										
(mean)	23.9	22.8	105	113	33.2	33.0	1951	2198	29.5	21.5
Cropping system										
(LSD 5%)	NS	1.0	NS	26.0	NS	NS	369	349	6.4	2.5
WAB 189-B-										
B-B-6-HB (mean)	24.3	22.7	101	141	34.5	32.3	2000	2042	29.4	22.6
ITA 150 (mean)	22.9	20.9	91	112	35.0	33.6	1784	1629	27.0	19.3
ITA 321 (mean)	27.2	23.4	136	150	30.8	34.6	2628	3029	30.3	21.2
Rice varieties										
(LSD 5%)	2.0	1.0	17	26	0.8	NS	369	349	NS	2.5
CV (%)	8.0	4.6	16	19	2.5	6.5	17	16	22.2	12.2

WAS = Weeks After Sowing; NS = Not Significant

Growth of Cassava

Plant Height and Number of Leaves of Cassava

Intercropping significantly affected plant height of cassava in 2002 at 8 WAP. ITA 321 grew taller (58.0 cm) than ITA 150 (52.0 cm) and WAB 189-B-B-B-6-HB (48.6 cm) when intercropped with TMS 30572. ITA 321 again grew taller (50.8 cm) than ITA 150 (47.9 cm) and WAB 189-B-B-B-6-HB (44.3 cm) when intercropped with TME 1 (Table 4). The number of leavses was significantly affected in both years at 12 WAP where sole cassava produced significantly more leaves than when intercropped with rice. In 2002, number of leaves of sole TMS 30752 was not significantly higher than when intercropped with rice varieties at 4, 8 and 12 WAP. The number of leaves of TMS 30572 intercropped with ITA 150 and ITA 321 at 12 WAP was significantly higher than the number of leaves of sole TME 1 and intercropped TME 1. In 2003, though intercropping had no significant effect on number of leaves at 4 and 8 WAP, number of leaves of sole TMS 30572 (50, 76 and 184) and sole TME 1(50, 83 and 114) were significantly higher than the number of leaves of intercropped TMS 30575 and TME 1 at 4, 8 and 12 WAP.

Leaf Area Index and Yield of Cassava

Intercropping significantly affected the leaf area index of cassava varieties at 8 WAP in 2002 and 2003. The leaf area index of sole TMS 30572 (1.2) and sole TME 1 (1.3) were lower than those of TMS 30572 and TME 1 intercropped with rice in 2002 (Table 5). TME 1 intercropped with ITA 321 (2.3) and WAB 189-B-B-B-6-HB (2.0) had higher leave area index than TMS 30572 intercropped with ITA 321 (1.8) and WAB 189-B-B-B-6-HB (1.8). In 2003, TMS 30572 and TME 1 intercropped with

Table 4: Plant height and number of leaves of cassava in sole crop and intercropping with rice in 2002 and 2003

	Plant height (cm)			Number of leaves		
	4	8	12	4	8	12
Treatments	WAP			WAP		
2002						
Sole cassava						
TMS 30572	33.2	56.2	93.4	43.0	74.0	142.0
TME 1	28.9	51.1	95.3	37.0	61.0	113.0
Intercrop cassava						
TMS 30572/WAB						
189-B-B-B-6-HB	30.3	48.6	84.3	43.0	76.0	124.0
TMS 30572/ITA 150	33.8	52.0	93.1	43.0	74.0	136.0
TMS 30572/ITA 321	29.9	58.0	99.8	41.0	84.0	137.0
TME 1/WAB-B-B-6-HB	28.5	44.3	85.0	33.0	66.0	98.0
TME 1/ITA 150	31.6	47.9	91.0	31.0	74.0	101.0
TME 1/ITA 321	28.2	50.8	93.6	36.0	67.0	107.0
LSD (5%)	NS	7.5	NS	NS	NS	21.5
CV (%)	10.7	8.5	10.2	22.4	14.5	10.2
2003						
Sole cassava						
TMS 30572	37.3	65.3	110.7	50.0	76.0	184.0
TME 1	39.1	82.3	116.0	50.0	83.0	114.0
Intercrop cassava						
TMS 30572/WAB						
189-B-B-B-6-HB	43.7	65.4	103.3	49.0	71.0	167.0
TMS 30572/ITA 150	40.7	74.8	112.3	51.0	72.0	168.0
TMS 30572/ITA 321	37.0	63.9	100.0	41.0	63.0	167.0
TME 1/WAB-B-B-6-HB	43.0	82.4	117.9	36.0	64.0	88.0
TME 1/ITA 150	32.4	71.1	114.0	37.0	65.0	100.0
TME 1/ITA 321	34.7	71.5	117.3	44.0	71.0	101.0
LSD (5%)	NS	NS	NS	NS	NS	23.9
CV (%)	25.9	18.7	8.0	16.0	19.3	10.0

WAP = Weeks After Planting; NS = Not Significant

Table 5: Leaf area and yield of cassava in sole crop and intercropping with rice in 2002 and 2003

Treatments	Leaf area index ----------WAP---------- 4	8	12	Yield/Tonnes ($t\ ha^{-1}$)
2002		WAP		
Sole cassava				
TMS 30572	0.6	1.2	1.3	38.0
TME 1	0.9	1.3	1.4	29.0
Intercrop cassava				
TMS 30572/WAB 189-B-B-B-6-HB	0.9	1.8	1.5	35.0
TMS 30572/ITA 150	1.3	1.7	1.6	37.0
TMS 30572/ITA 321	1.2	1.8	1.7	32.0
TME 1/WAB-B-B-6-HB	0.8	2.0	2.0	26.0
TME 1/ITA 150	1.0	1.6	1.7	26.0
TME 1/ITA 321	0.9	2.3	1.9	28.0
LSD (5%)	NS	0.5	NS	NS
CV (%)	56.8	17.7	18.4	19.4
2003				
Sole cassava				
TMS 30572	0.8	1.3	1.8	34.0
TME 1	1.4	2.3	2.7	22.0
Intercrop cassava				
TMS 30572/WAB 189-B-B-B-6-HB	2.2	2.3	2.0	27.0
TMS 30572/ITA 150	1.8	3.0	2.2	24.0
TMS 30572/ITA 321	1.1	2.1	3.0	25.0
TME 1/WAB-B-B-6-HB	1.7	3.3	2.7	13.0
TME 1/ITA 150	2.0	3.6	3.6	20.0
TME 1/ITA 321	1.8	3.3	3.1	17.0
LSD (5%)	NS	0.9	NS	5.1
CV (%)	34.3	20.7	25.5	12.9

WAP = Weeks After Planting; NS = Not Significant

ITA 150 had higher leave area index (3.0 and 3.6) than when the two varieties were intercropped with WAB 189-B-B-B-6-HB and ITA 321. In 2002, cropping system had no significant effect on the tuber yield of cassava varieties. The yields of sole cassava varieties were quite close to the yields of cassava varieties intercropped with rice. Sole TMS 30572 and sole TME 1 gave higher yields of 34 and 22 t ha^{-1} when compared with (27, 24 and 25 t ha^{-1}) and (13, 20 and 17 t ha^{-1}) at 4, 8 and 12 WAP when intercropped with rice varieties. TMS 30572 had higher tuber yield in 2002 and 2003 cropping season as a sole crop and when intercropped with rice.

DISCUSSION

The cropping system had no effect on the leaf area index of rice but among the rice varieties it was observed that ITA 321 had higher leaf area index than ITA 150 and WAB 189-B-B-B-6-HB in 2002 and 2003 cropping seasons. The number of tillers per hill and leaf area of rice are factors that determines the leaf area index. ITA 321 produced more tillers per hill than ITA 150 and WAB 189-B-B-B-6-HB either as a sole crop or when intercropped with cassava. When compared with ITA 150 and WAB 189-B-B-B-6-HB, it appears that ITA321 possesses better ability to intercept incident solar radiation and partition photosynthates into production of more tillers and productive panicles that resulted into higher grain yield either as a sole crop or when intercropped with cassava.

Intercropping affected the ability of rice to partition photosynthates into biological and economic yield because the harvest indexes of WAB 189-B-B-B-6-HB, ITA 150 and ITA 321 were reduced to 22.6, 19.3 and 21.2% in 2003 compared to 29.4, 27.0 and 30.3% recorded in 2002. The higher

population of sole rice per square meter was responsible for its higher grain yield compared to reduction in grain yield caused by TMS 30572 and TME 1 when intercropped with rice. Although both TMS 30572 and TME 1 reduced the grain yield of rice varieties in 2002 and 2003, there was no significant difference between the yield of rice varieties intercropped with either TMS 30572 or TME 1. This suggest that either of the cassava varieties could be intercropped with rice. The differences in the yield of rice varieties were largely related to differences in harvest index (Kiniry *et al*., 2001). In this study, differences in yield of rice varieties were largely due to differences in the number of tillers per hill, leaf area index, number of panicles per hill, panicle length, number of grains per panicle and 1000 grain weight.

The major determinant of leaf area index of cassava are leaf formation, sizes of the leaves, age of the plant and environment (IITA, 1990). This study shows that TME 1 had a higher leaf area index than TMS 30572 at 8 and 12 WAP because of its bigger leaf sizes and broader leaf formation. The relative good tuber yield of cassava intercrop could be due to proper cultural practice such as timely weeding of the rice component of the crop mixture. This also resulted into good retention of soil moisture and good canopy spread of the crops which confirms that the intercropped cassava and rice varieties were compatible with respect to parameters studied.

CONCLUSION AND RECOMMENDATION

This study reveals that the performance of the three rice varieties which yielded above 1 t ha^{-1} could not be adversely affected if TMS 30572 and TME 1 are introduced into the field two weeks after rice. There were no much differences in the yields of rice varieties intercropped with TMS 30572 and the non branching TME 1. ITA 321, a late maturing rice variety performed better than WAB 189-B-B-B-6-HB and ITA 150 when planted as a sole crop and when intercropped with cassava. WAB 189-B-B-B-6-HB however performed better than ITA 150 and did not suffer much yield loss when intercropped with cassava.

It is recommended that ITA 321 can be intercropped with either of the cassava types.

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